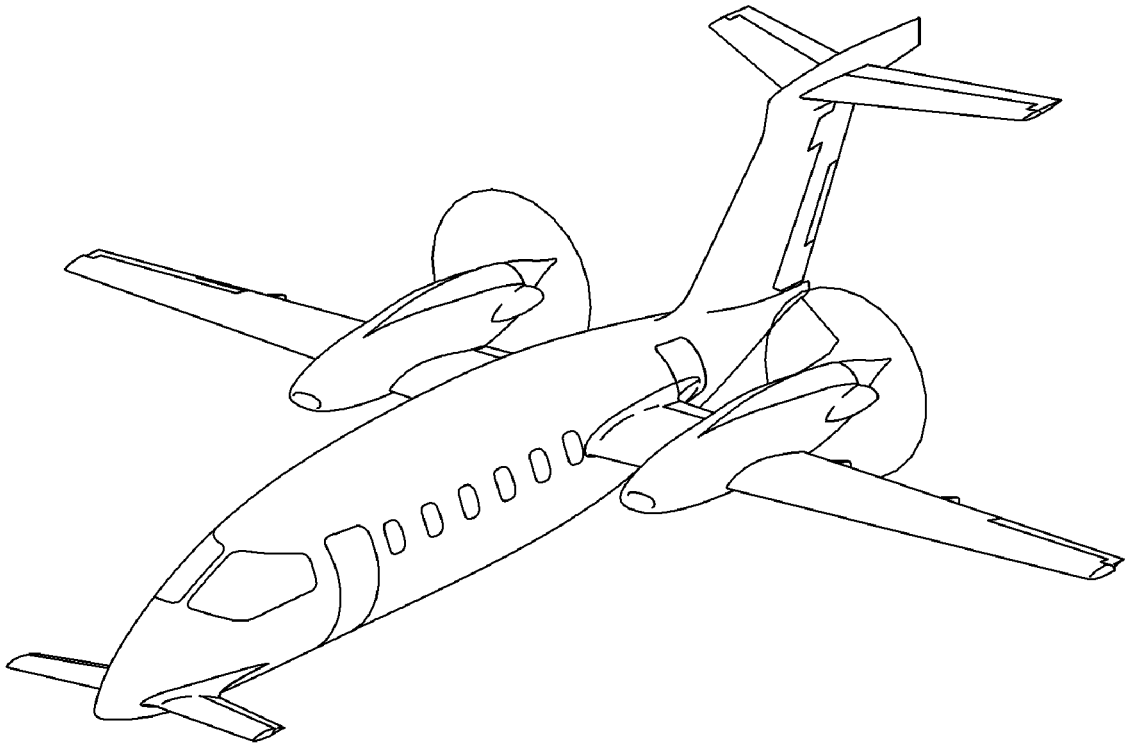
PIAGGIO AERO

P-180 AVANTI

PILOT'S OPERATING HANDBOOK AND AIRPLANE FLIGHT MANUAL

Airplanes Serial Numbers from 1026 to 1104
Airplanes Serial Numbers from 1004 to 1025 with S.B. 80-0023 installed



Report No. 6591
Handbook Reissue Date: June 19, 1992

Serial No._____
Registration No._____

THIS AIRPLANE FLIGHT MANUAL IS APPROVED BY THE REGISTRO AERONAUTICO ITALIANO.

FOR THE U. S. REGISTERED AIRPLANES THIS HANDBOOK IS APPROVED IN ACCORDANCE WITH THE PROVISIONS OF 14 CFR SECTION 21.29, AND IS REQUIRED BY FAA TYPE CERTIFICATE DATA SHEET NO. A59EU

R.A.I. Approval Letter: 282.378/SCMA

R.A.I. Approval Date: July 7, 1992

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY THE FEDERAL AVIATION REGULATIONS AND ADDITIONAL INFORMATION PROVIDED BY THE MANUFACTURER AND CONSTITUTES THE RAI/FAA APPROVED AIRPLANE FLIGHT MANUAL. THIS HANDBOOK MUST BE CARRIED IN THE AIRPLANE AT ALL TIMES.

PIAGGIO AERO INDUSTRIES
VIA CIBRARIO, 4
16154 GENOA
ITALY

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Airplanes Serial Numbers from 1026 to 1104
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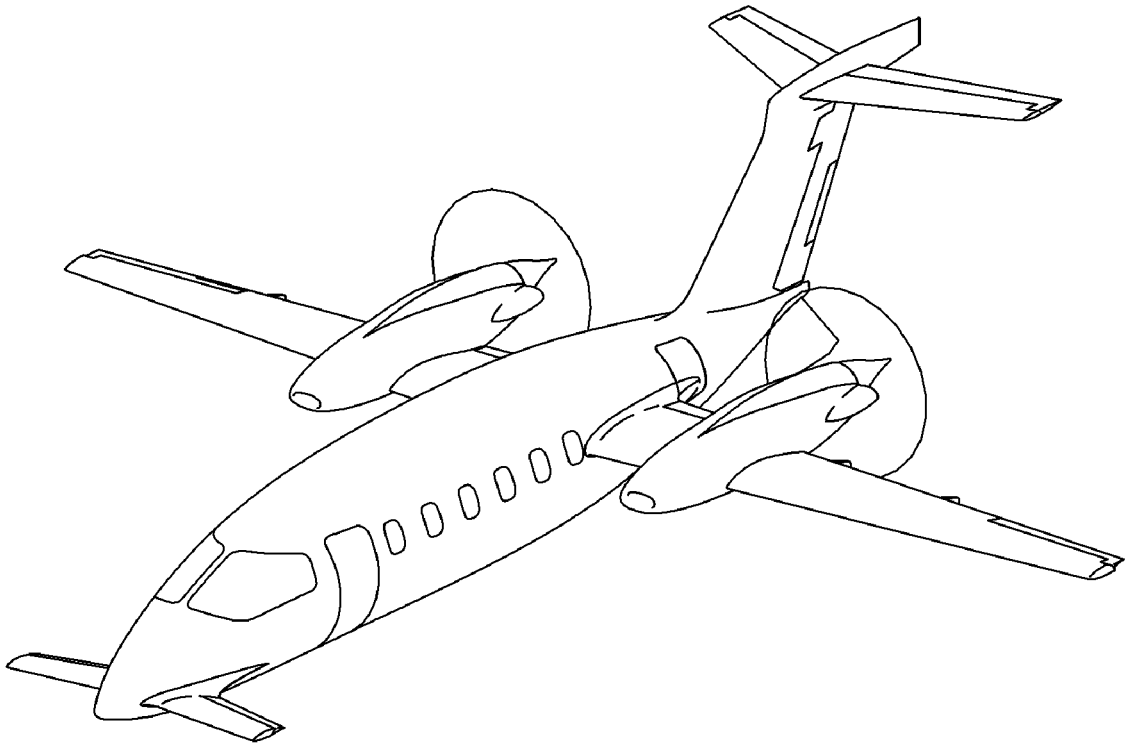

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SECTION 0

INTRODUCTION

APPLICABILITY

Application of this handbook is limited to the specific P-180 AVANTI model airplane designated by serial number and registration number on the face of the title page of this handbook.

This handbook cannot be used for operation purposes unless kept in a current status.

REVISIONS

The information compiled in the Pilot's Operating Handbook, with the exception of the equipment list, will be kept current by revisions distributed to the airplane owners. The equipment list was current at the time the airplane was licensed by the manufacturer and thereafter must be maintained by the owner.

Revision material will consist of information necessary to update the text of the present handbook and/or to add information to cover added airplane equipment.

I. Revisions

The original issue is identified by the revision code A0. Subsequent revisions are identified by the revision date and code: A1 for the first, A2 for the second, etc.
A complete reissue of the manual will be identified by the revision code B0. Subsequent revisions of the reissue will be identified as follows: B1 the first, B2 the second, etc.

Revisions will be distributed whenever necessary as complete page replacements or additions and shall be inserted into the handbook in accordance with the instructions given below:

1. Revision pages will replace only pages with the same page number.
2. Insert all additional pages in proper numerical order within each section.
3. Page numbers followed by a small letter shall be inserted in direct sequence with the same common numbered page.

NOTE

It is the responsibility of the owner to maintain this handbook in a current status when it is being used for operational purposes.

II. Identification of Revised Material

Revised text and illustrations shall be indicated by a black vertical line along the right margin of the page, opposite revised, added or deleted material. A line along the right margin of the page opposite the page number will indicate that an entire page was either renumbered or added.

Black lines will indicate only current revisions with changes and additions to or deletions of existing text and illustrations. Changes in capitalization, spelling, punctuation or the physical location of material on a page will not be identified by symbols.

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SECTION 9	**SUPPLEMENTS**	See Section 9 Table of Contents

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FOREIGN CERTIFICATIONS

For each foreign country for which specific pages are requested by the Certification Authority, a separate list of specific pages is here provided.

CANADIAN CERTIFICATION

The pages listed below are applicable only to the Canadian registered airplanes and bear the applicability limitation "Canadian A/C":

1.a, 2.a, 2-7.a, 2-13.a, 2-14.a, 2-16.a, 2-17.a, 2-18.a.

The lowercase suffix ".a" following the page number will identify the Canadian variant of the affected pages.

The note "RAI Approved" on the above listed pages means that they are approved according to the TRANSPORT CANADA letter ARD 5010-A529 dated July 26, 1991.

FEDERAL REPUBLIC OF GERMANY CERTIFICATION

The pages listed below are applicable only to the FRG registered airplanes and bear the applicability limitation "German A/C":

2-15.b, 9-83.b, 9-128.b, 9-140.b.

The lowercase suffix ".b" following the page number will identify the German variant of the affected pages.

The note "RAI Approved" on the above listed pages means that they are approved according to the LBA letter I 312-2075/91 dated September 23, 1991 and the LBA letter dated January 31, 1992.

NOTE

Supplement No. 5 "Global Wulfsberg GNS-X Multisensor Area Navigation System" at Section 9 of this Manual is not certified in Germany. The affected pages, from 9-89 to 9-96, are not applicable to the FRG registered airplanes.

FRENCH CERTIFICATION

The pages listed below are applicable only to the French registered airplanes and bear the applicability limitation "French A/C":

2-11.c, 9-51.c, 9-59.c, 9-60.c, 9-65.c, 9-76.c.

The lowercase suffix ".c" following the page number will identify the French variant of the affected pages.

The note "RAI Approved" on the above listed pages means that they are approved according to the D.G.C.A. fax. message No. 53544 revision one dated May 19, 1993.

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LIST OF EFFECTIVE PAGES

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Note: The List of Effective Pages, applicable to manuals of every operator, lists all the basic pages and the variants required by the foreign countries. Each manual must contain either basic pages or one variant only of these pages, as applicable.
Unless otherwise stated, pages are applicable to all airplanes. Each page variant has a specific applicability.
Pages affected by the current revision are indicated by an asterisk (*) following the revision code.

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PILOT'S OPERATING HANDBOOK LOG OF REVISIONS

Current Revisions to the P-180 AVANTI Pilot's Operating Handbook, REPORT: 6591 reissued June 19, 1992.

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B0		Reissue	R.A.I. Letter 282.378/SCMA dated July 7, 1992
B1		Option No. 3 and Standard "B" Cabin Configurations Supplements 9 and 10.	R.A.I Letter 284.656/MAE dated November 3, 1992
	0-7	Update List of Effective Pages.	
	0A-1	Update Log of Revisions.	
	2-13 and 2-13.a	Correct Noise Level.	
	6-22 to 6-23	Add Option No. 3 Cabin Configuration.	
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	6A-43 to 6A-45	Update Equipment List.	
	6A-47	Update Equipment List.	
	6A-51 to 6A-52	Update Equipment List.	
	9-ii to 9-iv	Revise and add pages to Table of Contents.	
	9-57	Amend Statement.	
	9-117 to 9-124	Add pages with Supplement 9.	
	9-125 to 9-136	Add pages with Supplement 10.	
B2		Option No. 8 Cabin Configuration.	R.A.I Letter 285.261/MAE dated December 24, 1992
	0-7	Update List of Effective Pages.	
	0A-1	Update Log of Revisions.	
	6-26 to 6-28	Add Option No. 8 Cabin Configuration.	
	6A-22/1	Add Option No. 8 Cabin Configuration.	
	6A-22/2	Add Blank Page.	

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PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B3		Miscellaneous Updating. Option No. 5, 9 and 10 Cabin Configurations.	R.A.I Letter 93/1449/MAE dated May 19, 1993
	0-5	Add NOTE at FRG Certification.	
	0-7	Update List of Effective Pages.	
	0A-2 to 0A-4	Update Log of Revisions.	
	2-9	Correct Max. Specific Load and Max. Weight.	
	2-23	Amend Placard.	
	4-ii	Update Table of Contents.	
	4-3	Add Note. Amend Caution. Rearrange material.	
	4-4	Rearrange material.	
	4-7	Amend step 5. at "Rear Fuselage (Left Side).	
	4-8	Add Test, Check and Warning from "Before Engine Starting".	
	4-9	Move steps to other Procedures. Add last step and Note. Rearrange step sequence.	
	4-10	Left Page Blank.	
	4-11	Add step and test. Renumber sequence.	
	4-12	Rearrange step sequence.	
	4-14 to 4-15	Add steps from "Before Engine Starting". Rearrange material and step sequence.	
	4-15	Add steps to "Taxiing". Amend step at 4.2.6.	
	4-16	Delete Note.	
	4-17	Add step to "Climb".	
	4-19	Rearrange step sequence. Add Note.	
	4-20	Add steps and Note. Rearrange material.	
	4-21	Add Note. Add step. Rearrange material.	
	4-23	Add Note. Amend Caution. Rearrange material.	
	4-24	Rearrange material.	
	4-28	Amend "Rear Fuselage (Left Side).	
	4-28 to 4-29	Add Test, Check and Warning from "Before Engine Starting".	
	4-29 to 4-30	Move steps to other Procedures. Add last step and Note. Rearrange material.	
	4-31	Add step and test.	
	4-32	Rearrange step sequence.	
	4-33	Add steps from "Before Engine Starting". Rearrange material and step sequence.	
	4-35 to 4-36	Rearrange material.	
	4-37	Add step. Rearrange material.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B3		(cont.)	R.A.I Letter 93/1449/MAE dated May 19, 1993
	4-38	Add steps to "Taxiing". Amend statement at 4.3.6. Delete Note to "Before Takeoff". Rearrange material.	
	4-39 to 4-41	Rearrange material.	
	4-40	Add statement to "Climb".	
	4-42	Rearrange "After Landing" sequence. Add steps and Note to "After Shutdown". Rearrange material.	
	4-43	Rearrange material. Add Note.	
	4-48	Amend step. Add step.	
	6-iii	Update List of Illustrations.	
	6-25	Add Cabin Baggage Compartment Table.	
	6-26	Amend table, add Warning and correct illustration.	
	6-28 to 6-29	Add Option No. 9 Cabin Configuration.	
	6-30 to 6-31	Add Option No. 10 Cabin Configuration.	
	6-32 to 6-33	Add Option No. 5 Cabin Configuration.	
	6-34	Add Blank Page.	
	6A-6	Add alternate Part Number.	
	6A-20	Add Option No. 5 Cabin Configuration.	
	6A-22/1	Amend item arm and moment.	
	6A-22/2	Add Option No. 9 Cabin Configuration.	
	6A-22/3	Add Option No. 10 Cabin Configuration.	
	6A-22/4	Add Blank Page.	
	6A-23	Add 25-50 Chapter/Section.	
	6A-38	Add alternate Part Number.	
	9-119	Add Altitude Limit. Amend Placard.	
	9-120	Amend "Normal Procedures".	
	9-128.b	Add page for German A/C.	
B4		French Certification.	R.A.I Letter 93/1559/MAE dated May 28, 1993
	0-5	List French Certification pages.	
	0-7	Update List of Effective Pages.	
	0A-3 to 0A-4	Update Log of Revisions.	
	2-i to 2-ii	Update Section 2 Table of Contents.	

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PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B4		(cont.)	R.A.I Letter 93/1559/MAE dated May 28, 1993
	2-11.c	Add page for French A/C.	
	2-22	Add Placard Position.	
	2-23	Add Placard.	
	7-13	Amend as per S.B. 80-0040.	
	7-35	Amend as per S.B. 80-0040.	
	9-16	Amend as per S.B. 80-0040.	
	9-30	Amend as per S.B. 80-0040.	
	9-51.c	Add page for French A/C.	
	9-59.c	Add page for French A/C.	
	9-60.c	Add page for French A/C.	
	9-65.c	Add page for French A/C.	
	9-76.c	Add page for French A/C.	
B5		Option No. 11 Cabin Configuration. Supplements 11, 12, 13, 14.	R.A.I Letter 93/2403/MAE dated August 10, 1993
	0-5	Add page at FRG Certification pages.	
	0-7	Update List of Effective Pages.	
	0A-4 to 0A-6	Update Log of Revisions.	
	6-iii	Update List of Illustrations.	
	6-4	Add NOTE.	
	6-34 to 6-36	Add Option No. 11 Cabin Configuration.	
	6A-22/2	Add LCD Monitors.	
	6A-22/3	Amend weights and Notes.	
	6A-22/4	Add Option No. 11.	
	6A-23	Add First Aid Kit.	
	6A-25	Correct Extinguisher position.	
	6A-44	Add Encoder Altimeter.	
	6A-45	Add Turn and Slip indicator.	
	6A-49	Add Single ATC installation.	
	6A-52	Add UNS-1A MMMS System.	
	6A-57	Add Supp. 13 and 14 items.	
	8-8	Amend Note.	
	9-iii	Update Table of Contents.	
	9-8	Remove altitude loss.	
	9-134	Remove ILS approaches.	
	9-137 to 9-148	Add pages with Supplement 11.	
	9-140.b	Add page for German A/C.	
	9-149 to 9-172	Add pages with Supplement 12.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B5		(cont.)	R.A.I Letter 93/2403/MAE dated August 10, 1993
	9-173 to 9-178	Add pages with Supplement 13.	
	9-179 to 9-186	Add pages with Supplement 14.	
B6		Noise Reduction, Overvoltage Protection, Supplements 15, and 16.	R.A.I Letter 93/3647/MAE dated December 24, 1993
	0-7	Update List of Effective Pages.	
	0A-5	Update Log of Revisions.	
	4-ii	Update Table of Contents.	
	4-48	Reprint for missing lines.	
	4-52 to 4-54	Add Noise Reduction Procedure.	
	6-6	Add Statement and Note.	
	6-11	Amend Usable Fuel Table.	
	7-46	Add Overvoltage Protection.	
	8-8	Add Overvoltage Protection.	
	9-iv	Update Table of Contents.	
	9-152	Add Statement at step 4.	
	9-154 to 9-158	Amend Illustrations.	
	9-161	Amend Statement.	
	9-162	Amend Table and Illustration.	
	9-164	Amend Table and Illustration.	
	9-167 to 9-170	Amend Arms and Moments.	
	9-187 to 9-194	Add pages with Supplement 15.	
	9-195 to 9-200	Add pages with Supplement 16.	
B7		Supplement 17 and Rubidium Frequency Standard.	R.A.I Letter 94/506/MAE dated February 18, 1994
	0-7	Update List of Effective Pages.	
	0A-5	Update Log of Revisions.	
	6A-51	Update Equipment List.	
	8-10	Amend shock absorber and tire pressure.	
	9-iv	Update Table of Contents.	
	9-82	Add Rubidium Frequency Std.	
	9-87	Add Rubidium Frequency Std.	
	9-201 to 9-212	Add pages with Supplement 17.	

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PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B8		Miscellaneous Updating.	R.A.I Letter 95/3054/MAE dated September 27, 1995
	0-7 to 0-8	Update List of Effective Pages.	
	0A-6	Update Log of Revisions.	
	1-4	List Approved Engine Oils.	
	2-6	List Approved Engine Oils.	
	2-7 and 2-7.a	Add Propeller Limitations.	
	3-8, 3-11, 3-14	Correct Emergency Landing Distance.	
	3-20	Correct Hydraulic Pressure Range.	
	3-38, 3-41, 3-43	Correct Emergency Landing Distance.	
	3-48	Correct Hydraulic Pressure Range.	
	4-37	Delete Note.	
	4-38	Correct Autofeather Test Settings.	
	6-1	Add Statement at GENERAL.	
	6A-44	Add Radio Altimeter P/N.	
	6A-45	Add Line.	
	6A-47	Add Transceiver P/N.	
	8-9 and 8-11,	Amend Switches Nomenclature.	
	8-13 and 8-14	Amend Switches Nomenclature.	
	9-118	Correct Compartment Volume.	
	9-149	Add Option Numbers.	
	9-153	Add Caution.	
	9-160	Add Step at Preflight Check.	
	9-162 and 9-163	Add Option Number. Rearrange Material.	
	9-164 and 9-165	Add Option Number. Rearrange Material.	
	9-167 and 9-168	Add Option Number. Correct Strap P/N.	
	9-169 and 9-170	Add Option Number. Correct Strap P/N.	
	9-201	Add Option Number.	
	9-202 and 9-205	Amend Inverter Data.	
	9-206	Add Option Number. Correct Litter 2 Arm and Moment.	
	9-207	Add Option Number.	
	9-208	Add Option Number. Correct Litter 2 Arm and Moment.	
	9-209	Amend Cylinder Pressure and Volume. Amend Inverter Data.	
	9-210	Amend Chart.	
	9-211 and 9-212	Amend Graph. Add Procedure.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B9		Operations on Contaminated Runways. Performance Updating.	R.A.I Letter 96/3683/MAE dated September 11, 1996
	0-7 to 0-8	Update List of Effective Pages.	
	0A-7 to 0A-8	Update Log of Revisions.	
	3-48	Add Caution.	
	4-ii	Update Table of Contents.	
	4-50	Add Statement to Note.	
	4-51 to 4-54	Change "Cold Weather Operation". Add "Operation on Contaminated Runways". Move and Renumber "External Noise Reduction Procedure".	
	5-i	Update Table of Contents.	
	5-2 to 5-5	Update "Flight Planning Example".	
	5-16 to 5-17	Update Performance Graphs.	
	5-33 to 5-38	Update Performance Graphs.	
	5-44 to 5-71	Update Performance Tables.	
	5-72	Update Performance Graph.	
	5-85 to 5-88	Add Contaminated Runways Performance.	
	6A-28	Add Flap Drive Unit P/N.	S.B. 80-0093.
	6A-59	Add Windshield P/Ns.	
B10		Updated Supplements No. 9 and No. 17. Added Supplements No. 18 and No. 19.	R.A.I Letter 97/2951/MAE dated July 18, 1997
	0-7 to 0-8	Update List of Effective Pages.	
	0A-7 to 0A-8	Update Log of Revisions.	
	1-4 to 1-5	Add NOTE.	
	2-7	Add WARNING.	
	2-7.a	Add WARNING.	
	2-23	Add placards.	
	6-30	Add statement.	
	6-30/1 to 6-30/2	Add Light Seat Configuration.	
	6A-3	Translate data to applicable Supplements.	
	6A-6	Add alternate installation arm and moment.	
	6A-22/3	Add Light Seat Configuration.	
	6A-22/4	Correct P/N.	
	6A-45	Add -014 DPU and MPU with related note.	
	6A-46	-002 DPU to be used with -002 MPU only.	
	9-iv	Update Table of Contents.	
	9-114	Insert data from Section 6.	
	9-118 to 9-119	Add statements and NOTEs.	

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PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B10		(cont.)	R.A.I Letter 97/2951/MAE dated July 18, 1997
	9-121	Insert data from Section 6. Add new arrangement.	
	9-123	Add statement.	
	9-164	Light Seat Configuration.	
	9-169 to 9-170	Add Light Seat Configuration.	
	9-201 to 9-224	Add new Air Ambulance Configuration.	
	9-225 to 9-236	Add Supplement # 18. Universal UNS-1D Flight Management System.	
	9-237 to 9-242	Add Supplement # 19. Bendix/King KHF990 HF Communication System.	
B11		Miscellaneous Updating.	R.A.I Letter 98/3318/MAE dated July 1, 1998
	0-7 to 0-8	Update List of Effective Pages.	
	0A-8	Update Log of Revisions.	
	0A-9 to 0A-10	Add pages for updating Log of Revisions.	
	2-5	Update Airstart Envelope.	
	3-5	Update Airstart Envelope.	
	3-34	Update Airstart Envelope.	
	6-30/2	Correct Arms and Moments.	
	6A-2	Update as per S.P.B. 80-0011.	
	6A-9	Update as per S.P.B. 80-0005.	
	6A-22/3	Update Light Seats P/N. Correct Arms and Moments.	
	6A-22/4	Add alternate Seats P/Ns.	
	6A-27	Update as per S.P.B. 80-0004.	
	6A-38	Update as per S.P.B. 80-0009.	
	6A-49	Update as per S.P.B. 80-0006.	
	6A-51	Translate items to Supplement # 4.	
	6A-52	Translate items to Supplement # 10 and Supplement # 11.	
	6A-55	Translate items to Supplement # 5.	
	6A-57	Translate items to Supplement # 6, Supplement # 13 and Supplement # 14.	
	6A-60	Translate items to Supplement # 7. Update as per S.P.B. 80-0008.	
	9-i to 9-iii	Update Table of Contents.	
	9-v to 9-vi	Add pages for updating Table of Contents.	
	9-7 to 9-12	Add Procedure. Rearrange Material.	Alert S.B. 80-0100
	9-12	Add NOTE.	

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Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B11		(cont.)	R.A.I. Letter 98/3318/MAE dated July 1, 1998
	9-56 to 9-57	Change "Before Takeoff" to "Before Taxi".	
	9-86	Insert items from Section 6 page 6A-51.	
	9-91 to 9-96	Rearrange Material.	
	9-94	Insert items from Section 6 page 6A-55.	
	9-101	Insert items from Section 6 page 6A-57.	
	9-108	Insert items from Section 6 page 6A-60.	
	9-131 to 9-132	Insert items from Section 6 page 6A-52.	
	9-143 to 9-144	Insert items from Section 6 page 6A-52.	
	9-164	Correct Arm and Moments.	
	9-169	Update Light Seats P/N. Correct Arms and Moments.	
	9-170	Correct Arm and Moment.	
	9-176	Insert items from Section 6 page 6A-57.	
	9-183	Insert items from Section 6 page 6A-57.	
	9-210	Correct Arm and Moments.	
	9-212	Update Light Seat P/N. Correct Arms and Moments.	
	9-214	Correct Arm and Moments.	
	9-216	Update Light Seat P/N. Correct Arms and Moments.	
	9-243 to 9-250	Add Supplement # 20.	S.B. 80-0058.
B12		Add new Engine Oil and optional Avionics equipment.	R.A.I. Letter 98/6010/MAE dated December 4, 1998
	0-7 to 0-8	Update List of Effective Pages.	
	0A-9 to 0A-10	Update Log of Revisions.	
	1-4	Add Approved EXXON Engine Oil.	
	2-i to 2-ii	Update Table of Contents.	
	2-6	Add Approved EXXON Engine Oil.	
	2-13	Add Paragraph 2.18.7.	
	2-13.a	Add Paragraph 2.18.7.	
	4-11 to 4-13	Add NOTE to Engine Starting procedures.	
	4-31 to 4-32	Add NOTE to Engine Starting procedures.	
	6-36 to 6-37	Add Option No. 16 Cabin Configuration.	
	6-38	Add blank page.	
	6A-9	Add Cabin Audio Panel P/N.	
	6A-22/5	Add Option No. 16 Cabin Configuration.	
	6A-22/6	Add blank page.	
	6A-28	Update as per S.P.B. 80-0015.	

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PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B12		(cont.)	R.A.I. Letter 98/6010/MAE dated December 4, 1998
	6A-43 to 6A-44	Specify Altimeter location.	
	6A-53	Move VHF NAV 1 items to another page.	
	6A-55	Add VHF NAV 1 items. Add new P/Ns.	
	7-1 to 7-2	Specify the new metal structures.	
	7-48	Add Cabin Power Provisions.	
	7-63	Add optional secondary Encoder Altimeter.	
	7-71 to 7-72	Add optional Avionics equipments.	
	9-v	Update Table of Contents.	
	9-118	Add alternate system Supplier.	
	9-121	Add alternate system Supplier.	
	9-122	Add alternate Supplier items.	
	9-217	Specify electrical power sources.	
	9-226 to 9-227	Add Software Configuration No. 703.x.	
	9-238	Specify electrical power connections.	
	9-239	Correct CAUTION.	
	9-240	Correct CAUTION. Correct items P/Ns.	
	9-241	Specify electrical power connections.	
	9-251 to 9-254	Add Supplement # 21.	
B13		Engine Starting Limitations. UNS GPS/OSS 764-1 Sensor "week rollover".	R.A.I. Letter 00/066/MAE dated January 11, 2000
	0-7 to 0-8	Update List of Effective Pages.	
	0A-10	Update Log of Revisions.	
	2-7	Amend Engine Starting Limitations.	
	2-7.a	Amend Engine Starting Limitations.	
	4-12	Add Statement at Step 3. of Cross-start Procedure.	
	4-32	Add Statement at Cross-start Procedure.	
	7-2	Correct Horizontal Stabilizer construction material.	
	9-126 to 9-128	UNS GPS/OSS 764-1 Sensor disablement.	
	9-128.b		
	9-133 to 9-135		
	9-137 to 9-140		
	9-140.b		
	9-145 to 9-147		

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Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B14		UNS-1K Flight Management System. Emergency Exit Handle Locking Pin. Equipment List Updating.	R.A.I. Letter 00/732/MAE dated March 6, 2000
	0-7 to 0-8	Update List of Effective Pages.	
	0A-11 to 0A-12	Add pages for updating Log of Revisions.	
	4-9	Add statement at step # 2.	
	4-20 to 4-21	Add step at "After Shutdown" and renumber subsequent steps.	
	4-29	Add statement at "Before Engine Starting".	
	4-42	Add statement at "After Shutdown".	
	6A-5	Add A/P Computer P/N.	
	6A-6	Add VHF-22C Comm. System.	
	6A-17	Add divan P/N.	
	6A-33	Add engine air inlet deicer P/N.	
	6A-64	Add pressure transducer alternate P/N.	
	9-v	Add Supplement # 22 to Table of Contents.	
	9-239	Add Note and amend Caution.	
	9-240	Amend Equipment List.	
	9-255 to 9-266	Add Supplement # 22.	
B15		Wing Fuel Tank Extension. Universal CVR-30B Cockpit Voice Recorder. NAT NTX138 VHF/FM HI Comm. System. Configuration "C" Airambulance Equipment.	R.A.I. Letter 00/1420/MAE dated May 8, 2000
	0-7 to 0-8	Update List of Effective Pages.	
	0A-11 to 0A-12	Update Log of Revisions.	
	1-4	Add fuel quantity of extended tank system.	
	2-11	Add fuel quantity of extended tank system.	
	2-11.c	Add fuel quantity of extended tank system.	
	2-20	Add placard for extended fuel tanks.	
	2-21	Add placard for emer. exit door handle.	
	3-28	Add statement for emer. exit door handle.	
	4-24	Add Note to L/G position indicator check.	
	6-28	Update Usable Fuel Loading Chart.	
	6A-30	Add fuel quantity probe for extended tanks.	
	6A-43	Add alternate copilot airspeed indicator P/N.	
	6A-60	Add alternate propeller RPM transducer P/N.	
	6A-63	Add alternate turbine RPM transducer P/N.	
	7-1	Update Emergency window description.	
	8-6	Update "Parking" paragraph.	
	9-iv to 9-v	Update Section 9 Table of Contents.	

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PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B15		(cont.)	R.A.I. Letter 00/1420/MAE dated May 8, 2000
	9-201 to 9-224	Completely update Supplement # 17.	
	9-262	Correct P/N in Equip. List at Suppl. # 23.	
	9-267 to 9-272	Add Supplement # 23.	
	9-273 to 9-276	Add Supplement # 24.	
B16		Option #2 Cabin Configuration.	R.A.I. Letter 00/1550/MAE dated May 17, 2000
	0-7 to 0-8	Update List of Effective Pages.	
	0A-12	Update Log of Revisions.	
	6-iii	Update List of Illustrations.	
	6-38 to 6-40	Add Option #2.	
	6A-14	Add Option #2.	
	9-216	Correct Total Weight, Arm and Moment.	
B17		ITT Limit at Minimum Idle.	R.A.I. Letter 00/2293/MAE dated August 2, 2000
	0-7 to 0-8	Update List of Effective Pages.	
	0A-12	Update Log of Revisions.	
	2-4	Update ITT Limit at Minimum Idle.	
B18		Supplements # 18 and # 22 Updating. Equipment List Updating.	R.A.I. Letter 00/4461/TTO dated September 11, 2000
	0-7 to 0-8	Update List of Effective Pages.	
	0A-12 to 0A-14	Update Log of Revisions.	
	6A-3	Add Pressure Regulator.	
	6A-28	Add Alternate P/N's.	
	6A-43	Add Alternate P/N.	
	6A-45	Add Alternate P/N.	
	9-226	Update "General".	
	9-227	Update "Limitations" and rearrange material.	
	9-228	Update "Limitations" and rearrange material. Update "Emergency Procedures".	
	9-229	Delete "Note".	
	9-231	Add "Caution" at steps 2) and 3). Add step 4).	

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Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B18		(cont.)	R.A.I. Letter 00/4461/TTO dated September 11, 2000
	9-234 to 9-235	Update "Description".	
	9-257	Update steps d) and e).	
	9-261	Add "Caution" at steps 2) and 3). Add step 4).	
	9-264 to 9-265	Update "Description".	
B19		Supplements # 9 Updating for a new Keith Equipment.	R.A.I. Letter 00/6292/TTO dated December 22, 2000
	0-7 to 0-8	Update List of Effective Pages.	
	0A-13	Update Log of Revisions.	
	4-11	Correct ITT limit at "Warning".	
	4-31	Correct ITT limit at "Warning".	
	9-118	Add new Keith equipment at "General".	
	9-121	Specify previously installed Keith equipment.	
	9-122	Add new Keith system Equipment List.	
B20		Unpaved Runways Operations (Suppl. # 25). New Environmental System Configuration. Miscellaneous Updating.	ENAC Letter 171059/SPA dated July 25, 2001
	0-7 to 0-8	Update List of Effective Pages.	
	0A-13 to 0A-14	Update Log of Revisions.	
	2-13	Change Note at "Unpaved Runways".	
	3-4	Change Note at "Engine Fire" procedure.	
	3-5	Update Air Start Envelope.	
	3-23	Amend "Environ. Auto Control Failure".	
	3-34	Update Air Start Envelope.	
	3-38	Amend statement on brakes operation.	
	3-51	Amend "Environ. Auto Control Failure".	
	4-11	Amend WARNING at "Engine Starting"	
	4-12 to 4-13	Correct ITT limit to 750°C.	
	4-14	Add NOTE at "Before Taxi"	
	4-15	Rearrange Material.	
	4-31	Amend WARNING at "Engine Starting", Correct ITT limit to 750°C.	
	4-33	Add NOTE at "Before Taxi".	
	6A-3	Add Environmental System items.	
	6A-7	Add VHF-22D Communication System.	

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PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B20		(cont.)	ENAC Letter 171059/SPA dated July 25, 2001
	6A-8 to 6A-10	Rearrange Material.	
	6A-11	Add Alternate Supplier item.	
	6A-14	Add Alternate Cabinet P/N.	
	6A-22/3	Add Alternate Supplier seats.	
	6A-23	Add Alternate ELT system.	
	6A-28	Add Flap Control Lever.	
	6A-49	Add Alternate CAD62 P/N.	
	6A-50	Add Mode-S ATC Transponder.	
	7-i	Update Table of Contents.	
	7-58	Add Statement.	
	7-60/1 to 7-60/2	Add Heating Unit Configuration.	
	7-72	Add Mode-S ATC Transponder.	
	7-75	Add Statement.	
	7-76 to 7-77	Add new ELT Configuration.	
	7-77 to 7-78	Rearrange Material.	
	9-v to 9-vi	Update Table of Contents.	
	9-122	Add new Keith Unit installation position. Change Progres Unit P/N.	
	9-255 to 9-257	Add MMMS configuration changes.	
	9-262 to 9-264	Add MMMS configuration changes.	
	9-277 to 9-284	Add Supplement # 25.	
B21		Category II Operations (Suppl. # 26).	ENAC Letter 171224/SPA dated October 15, 2001
	0-7 to 0-8	Update List of Effective Pages.	
	0A-14	Update Log of Revisions.	
	9-vi	Update Table of Contents.	
	9-285 to 9-298	Add Supplement # 26.	
B22		RVSM Provision (Suppl. # 27) Equipment List Updating Steering Sytem Operations Update Miscellaneous Updating	ENAC Letter 02/171297/SPA dated May 29, 2002
	0-7 to 0-8	Update List of Effective Pages.	
	0A-14	Update Log of Revisions.	
	0A-15 to 0A-16	Add pages to Update Log of Revisions.	
	1-5	Update Typical Equipped Empty Weight.	
	2-5	Correct Air Start Envelope.	
	2-7	Amend Caution at par. q.	
	2-7a	Amend Caution at par. q.	
	2-12	Amend statement at par. 2.18.4.	
	3-2	Add step 9 at "Engine Securing"	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B22		(cont.)	ENAC Letter 02/171297/SPA dated May 29, 2002
	3-3	Rearrange and amend procedure at "Engine Failure During Take-off".	
	3-16	Correct N_p to 2205 RPM.	
	3-29	Add step at "Engine Securing".	
	3-31	Rearrange procedure at "Engine Failure During Take-off".	
	3-37	Correct statement in "Emerg. Descent".	
	3-44	Correct N_p to 2205 RPM.	
	4-18	Amend "Landing" procedure.	
	4-19	Amend step 2 at "After Landing".	
	4-41	Amend "Landing" procedure.	
	4-42	Amend statement at "After Landing".	
	4-53	Amend "Landing" procedure.	
	4-54	Amend "Landing" procedure.	
	6-30/2	Amend statement.	
	6A-2	Add Emer. S/O Valve Alternate P/N.	
	6A-14	Add Option #2 seats Alternate P/N's.	
	6A-17	Add Option #1 seats and refresment cabinet Alternate P/N's.	
	6A-23	Correct ELT Sys. DMELT8 weight value.	
	6A-25	Correct Engine Fire Ext. weight value.	
	6A-29	Add Booster Pump Alternate P/N. Add Fuel Filter Alternate P/N.	
	6A-35	Add Alt. Indicating/Recording Sys. P/N's	
	6A-43	Add Alternate copilot Altimeter P/N.	
	6A-45	Add Alternate EPU P/N.	
	6A-47	Add Alternate Transceiver/Antenna P/N.	
	6A-64	Add Alternate Oil Cooler P/N.	
	7-29	Update boost pump electrical supply.	
	7-47	Add EPB description.	
	9-vi	Update Table of Contents.	
	9-164	Amend statement.	
	9-169 to 9-170	Add Opt. #14 Alternate P/N's.	
	9-208	Amend statement.	
	9-214 to 9-215	Add light seat alternate P/N.	
	9-280 to 2-281	Add Caution, amend procedure at "Landing".	
	9-299 to 9-304	Add Supplement # 27.	
B23		RVSM Operations (Suppl. #28)	ENAC Letter 02/171452/SPA dated July 24, 2002
	0-7 to 0-8	Update List of Effective Pages.	
	0A-15	Update Log of Revisions.	
	5-15	Add Note for Altimeter Calibration.	
	9-vi	Update Table of Contents.	
	9-305 to 9-318	Add Supplement #28	

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PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B24		Wing Fuel Tank Extension (effectivity) Green Cabin Configuration Hyd. Pack. electrical control syst. updating 14 Vdc Auxiliary Power System Equipment List Updating	ENAC Letter 03/171005/SPA dated January 9, 2003
	0-7 to 0-9	Update List of Effective Pages.	
	0-10	Add Blank Page.	
	0A-16	Update Log of Revisions.	
	1-4	Update effectivity of extended fuel tank.	
	2-11	Update effectivity of extended fuel tank.	
	2-11.c	Update effectivity of extended fuel tank.	
	2-20	Update effectivity of extended fuel tank.	
	2-26	Add placard for 14 Vdc Aux. Power Sockets.	
	6-iii	Update List of Figures.	
	6-11	Update effectivity of extended fuel tank.	
	6-40 to 6-41	Add Green Cabin Conf. loading charts.	
	6-42	Add Blank Page.	
	6A-10	Add Audio Panel alternate P/N's.	
	6A-11	Add DC/DC Power Converter P/N.	
	6A-17	Add two place divan HB alternate P/N, update refreshment cabinet weight.	
	6A-21	Add two place divan HB alternate P/N.	
	6A-27	Add Triple Trim Indic. alternate P/N.	
	6A-28	Add Flap Position Indic. alternale P/N.	
	6A-29	Add Booster Pump alternate P/N.	
	6A-30	Add Fuel Quantity Indic. alternate P/N, update extended fuel tank probe effectivity.	
	6A-37	Add NLG Drag Strut and Actuator alt. P/N and MLG Actuators alternate P/N's.	
	6A-43	Add Air Data Computer ADC-85A P/N.	
	6A-44	Rearrange Material:	
	6A-60	Add Propeller RPM Indic. alternate P/N.	
	6A-62	Add Flow Rate Indic. alternate P/N.	
	6A-63	Add Torque Indic., Turbine RPM Indic. and Turbine Temp. Indic. alternate P/N.	
	6A-64	Add Oil Temp. & Press. Indic. altern. P/N.	
	7-12	Update HYD PRESS Annunc. operation.	
	7-28	Update effectivity of extended fuel tank.	
	7-32	Update HYD PRESS Annunc. operation	
	7-48	Add 14 Vdc Aux. Power Syst. description.	
	8-12	Update effectivity of extended fuel tank.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B25		Option #19 Cabin Configuration. Equipment List Updating.	ENAC Letter 03/171241/SPA dated June 10, 2003
	0-7 to 0-8	Update List of Effective Pages.	
	0A-17	Update Log of Revisions.	
	0A-18	Add Blank Page.	
	2-27	Add Placard.	
	2-28	Add Blank Page.	
	4-38	Amend Autofeather Test Procedure.	
	6-iii	Update List of Illustrations.	
	6-14	Add 2-place Divan Alternate P/N.	
	6-18	Add 2-place Divan Alternate P/N.	
	6-42 to 6-43	Add Option #19 Cabin Configuration.	
	6-44	Add Blank Page.	
	6A-17	Add 2-place Divan Alternate P/N.	
	6A-21	Add 2-place Divan Alternate P/N.	
	6A-22/6	Add Option #19 Cabin Configuration.	
	6A-37	Add Alternate Drag Struct P/N's.	
	6A-64	Add Alternate Engine Oil Cooler P/N.	
B26		TCAS I System (Supplement #29) UNS-1L Flight Manag. Syst. (Suppl. #30) Underwater Acoustic Beacon Equipment List Updating	EASA Approval No. 2385 dated January 7, 2004
	0-7 to 0-9	Update List of Effective Pages.	
	0A-17	Update Log of Revisions.	
	6A-3	Add Pressure Regulator alternate P/N.	
	6A-11	Add AC/DC Static Inverter alternate P/N.	
	6A-17	Add Opt. #1 one place divane and refreshment cabinet alternate P/N.	
	6A-23	Add Underwater Acoustic Beacon P/N.	
	6A-27	Add Aileron and Rudder Trim Tab Actuators alternate P/N's.	
	7-ii	Update Table of Contents.	
	7-78	Add description of UAB.	
	9-vi to 9-vii	Update Table of Contents	
	9-viii	Add Blank Page.	
	9-319 to 9-330	Add Supplement #29.	
	9-331 to 9-342	Add Supplement #30.	

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PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B27		Supplement #25 Updating Steep Approach Operations (Suppl. #31) Flight Envelope Extension (Suppl. #32) Opt. #20 and #21 Cabin Conf. (Suppl. #33) TAWS System (Suppl. #34) Chip Detector Monitoring System Increased Max. Zero Fuel Weight Equipment List Updating	EASA Approval No. 2004-4803 dated May 4, 2004
	0-7 to 0-9	Update List of Effective Pages.	
	0A-18	Update Log of Revisions.	
	0B-1 to 0B-4	Add Record of Embodiment/Removal.	
	1-4	Update Max. Zero Fuel Weight limit.	
	2-iii	Update List of Illustrations.	
	2-9	Update Max. Zero Fuel Weight limits.	
	2-10	Update number and title of Figure.	
	2-10/1	Add Figure with new MZFW limit.	
	2-10/2	Add Blank Page.	
	3-6	Remove instruction in "Smoke in Cockpit".	
	3-36	Remove instruction in "Smoke in Cockpit".	
	4-i	Update Table of Contents.	
	4-5	Add Caution for chip detect. monitoring syst.	
	4-25	Rearrange Material.	
	4-26	Add procedure for chip detect. monitoring syst.	
	6-iii	Update List of Illustrations.	
	6-6	Update references to figures.	
	6-7 to 6-8	Update number and title of figures.	
	6-8/1 to 6-8/2	Add Figures with new MZFW limit.	
	6A-27 to 6A-28	Correct Triple Trim and Flap Position Indicators P/N's.	
	6A-30	Add Fuel Indicating alternate P/N's.	
	6A-35	Add upgraded Ground Test/Refuel Panel P/N.	
	7-18	Add upgraded GT&RP operation description.	
	7-19	Rearrange Material.	
	7-22	Add upgraded GT&RP operation description.	
	7-59	Update Environ. Control Syst. description.	
	7-60/2	Update Environ. Control Syst. description.	
	8-11	Add Caution for chip detect. monitoring syst.	
	9-i	Update Table of Contents.	
	9-vi to 9-vii	Update Table of Contents.	
	9-1	Add Paragraph (Optional Supplements).	
	9-278 to 9-284	Update Suppl. #25.	
	9-323	Add combined TCAS I & TAWS operations.	
	9-324	Correct ATA chapter.	
	9-343 to 9-348	Add Supplement #31.	
	9-349 to 9-354	Add Supplement #32.	
	9-355 to 9-370	Add Supplement #33.	
	9-371 to 9-378	Add Supplement #34.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B28		SeaFLIR II System (Suppl. No. 35). Equipment List Updating. Miscellaneous Updating.	EASA Approval No. 2005-61 dated January 3, 2005
	0-7 to 0-9	Update List of Effective Pages.	
	0A-19	Update Log of Revisions.	
	0A-20	Add Blank Page.	
	4-5	Add step in Preflight Check Procedure.	
	4-26	Add step in Preflight Check Procedure.	
	6A-10	Add Audio Panel Alternate P/N.	
	6A-28	Add FDU and FCU new P/N's.	
	6A-29	Correct Fuel Booster Pump P/N.	
	6A-37	Correct MLG Actuators P/N's.	
	6A-47	Add Weather Radar Trans./Ant. Alt. P/N.	
	9-vii to 9-viii	Update Table of Contents.	
	9-371	Add figure in Suppl. 33 Description.	
	9-372	Rearrange Material.	
	9-373 to 9-380	Revise pages numbering.	
	9-379	Revise figure numbering.	
	9-381 to 9-402	Add Supplement No. 35.	
B29		Rep. 6591 applicability updating. Increased MTOW [12100 lbs] (Suppl. N.36).	Rev.B29 is approved under the authority of DOA No. EASA.21J.220 Date: March 15, 2006
	1	Update Airplanes Serial Numbers.	
	1.a	Update Airplanes Serial Numbers.	
	0-7 to 0-9	Update List of Effective Pages.	
	0A-19	Update Log of Revisions.	
	9-viii	Update Supplements Table of Contents.	
	9-403 to 9-500	Add Supplement No.36 (if applicable).	
B30		Miscellaneous updating.	EASA Approval No. EASA.A.A.01497 dated July 14, 2008
	0-7 to 0-9	Update List of Effective Pages.	
	0A-19 to 0A-20	Update Log of Revisions.	
	2-4	Update Oil temp. limitations. Correct ITT Norm. Climb/Cruise (reprint error).	
	2-5	Update Engine operating limits notes.	
	2-9	Correct doc. reprint errors.	
	3-2	Update Egine Securing procedure.	
	3-3	Correct step.	
	3-4	Update procedures.	
	3-6	Add clarification, correct step and update Electrical Fire or Smoke procedure.	
	3-7	Correct step (doc. reprint error).	
	3-8	Correct title and caution(doc. reprint error).	
	3-18	Update Dual Generator Failure procedure.	
	3-22	Correct steps (doc. reprint error).	

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PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont.)

Rev. No.	Revised Pages	Description of Revision	Approval Signature and Date
B30		(cont.)	EASA Approval: No. EASA.A.A.01497 dated July 14, 2008
	3-23 to 3-24	Update Cabin Press Auto Mode Failure and Env. Auto Control failure procedure.	
	3-29	Update Egine Securing procedure.	
	3-32	Update Engine Fire procedure.	
	3-33	Update Engine Failure procedure.	
	3-36	Update Smoke in Cockpit procedure.	
	3-46	Update Dual Generator Failure proccedure.	
	3-51 to 3-52	Update Cabin Press Auto Mode failure & Env. Auto Control failure procedures.	
	4-19	Update After Landing procedure.	
	4-20	Add Caution for passenger door opening.	
	4-35	Correct Stall Warning Test procedure.	
	4-39	Add Note.	
	4-42	Update After Landing procedure and add information for passenger door opening.	
	4-43 to 4-44	Rearrange material.	
	7-33	Correct figure.	
	7-72	Add information about radar display.	
	9-181 to 9-182	Correct step.	
	9-292	Correct graph title.	
	9-384	Correct graph titles.	
	9-388 to 9-389	Correct graph titles.	
	9-407.bis	Add Page applicable to S/N 1004 to 1015.	
	9-498.bis	Add Page applicable to S/N 1004 to 1015.	

PILOT'S OPERATING HANDBOOK RECORD OF EMBODIMENT/REMOVAL

Retain this Record inside the Manual. On receipt of embodiment pages (i.e. Manual Revisions, Optional Supplements, Temporary Revisions, etc.) make an entry in the Record Table inserting Description, Issue Date, Embodiment Date and Initials. In case of removal pages (Temporary Revisions, Supplements, etc.) make an entry in the Record Table inserting Description, Issue Date, Removal Date and Initials.

Description	Issue Date	Embodiment Date	By	Removal Date	By

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PILOT'S OPERATING HANDBOOK RECORD OF EMBODIMENT/REMOVAL (cont.)

Description	Issue Date	Embodiment Date	By	Removal Date	By

PILOT'S OPERATING HANDBOOK RECORD OF EMBODIMENT/REMOVAL (cont.)

Description	Issue Date	Embodiment Date	By	Removal Date	By

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PILOT'S OPERATING HANDBOOK RECORD OF EMBODIMENT/REMOVAL (cont.)

Description	Issue Date	Embodiment Date	By	Removal Date	By

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GENERAL

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LIST OF ILLUSTRATIONS

Figure 1-1. THREE VIEW 1-2

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SECTION 1

GENERAL

1.0 INTRODUCTION

This Pilot's Operating Handbook is designed for the maximum utilization as an operating guide for the pilot. It includes the material required to be furnished to the pilot by the Federal Aviation Regulation and Regolamento Tecnico R.A.I. and additional information provided by the manufacturer. The Handbook meets GAMA Specification No. 1.

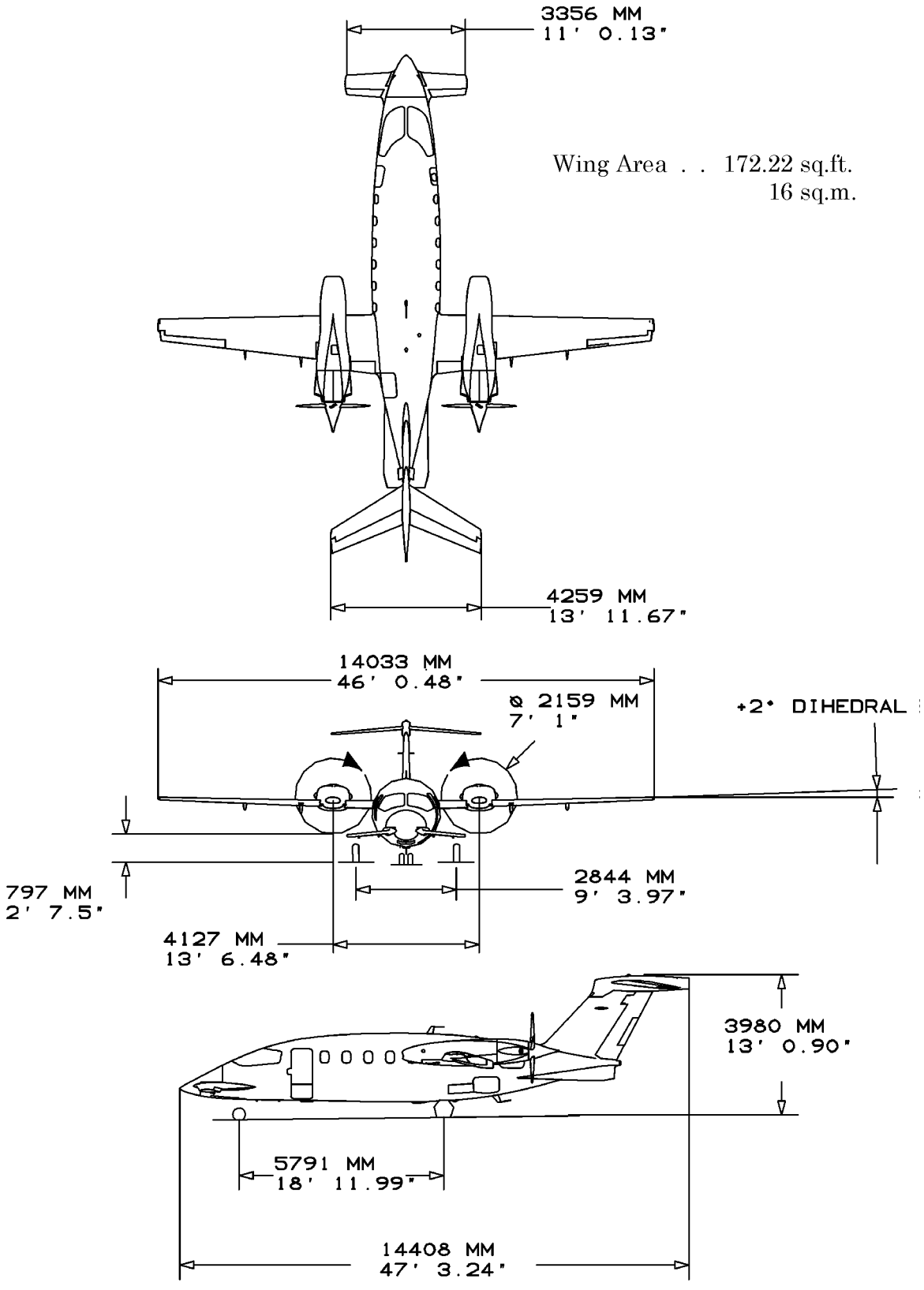

Figure 1-1. THREE VIEW

1.1 ENGINES

a. Number of Engines	2
b. Engine Manufacturer	Pratt & Whitney Canada
c. Engine Model Number	PT6A-66
d. Rated Horsepower	850
e. Propeller Speed(rpm)	
Takeoff and climb	2000
Cruise	1800/2000
f. Engine Type	Free Turbine, Reverse Flow, 2-Shaft
Compressor stages and type	4 axial stages 1 centrifugal stage
Turbine stages and type	1 stage compressor 2 stages power
Combustion chamber type	annular

1.2 PROPELLERS

a. Number of Propellers	2
b. Propeller Manufacturer	Hartzell
c. Blade Models	
Left (CW Rotating, inner tip down)	HE 8218
Right (CCW Rotating, inner tip down)	LE 8218
d. Number of Blades	5
e. Hub Models	
Left (CW Rotating)	HC-E5N-3 or HC-E5N-3A
Right (CCW Rotating)	HC-E5N-3L or HC-E5N-3AL
f. Propeller Diameter	85 in. (2.16 m.)
g. Propeller Type	Hydraulically Operated, Single Acting, Constant Speed, Full Feathering, Reversible

1.3 FUEL

a. Total Capacity
   (S.N. 1004 to 1035 airplanes) — 396.3 U.S. Gal. (1500 LTS)
   (S.N. 1016 to 1035 with SB-80-0123 embodied and S.N. 1036 and up airplanes) — 421.9 U.S. Gal. (1597 LTS)

b. Usable Fuel
   (S.N. 1004 to 1035 airplanes) — 392.6 U.S. Gal. (1486 LTS)
   (S.N. 1016 to 1035 with SB-80-0123 embodied and S.N. 1036 and up airplanes) — 418.2 U.S. Gal. (1583 LTS)

c. Fuel Specification — Refer to latest revision of Pratt & Whitney Service Bulletin No.14004 (including Jet A, Jet A-1, Jet B, JP4 and JP8)
Aviation Gasoline is not permitted

d. Approved Additives — Anti Ice Additive per latest revision of Pratt & Whitney Service Bulletin No.14004 (including Phillips PFA 55 MB, MIL-I-27686D and MIL-I-27686E)

1.4 OIL

a. Total Oil Capacity (each engine) — 3.35 U.S. Gal. (12.7 LTS)

b. Usable Oil Quantity (each engine) — 1.25 U.S. Gal. (4.7 LTS)

c. Oil Specification

Only MOBIL JET OIL II, AEROSHELL TURBINE OIL 500, CASTROL 5000 and EXXON TURBO OIL 2380 engine oils have been tested and are approved for use on the P.180 airplane within the recommendations of the latest revision of P&WC Engine Service Bulletin No. 14001.
The other oils listed in the above P&WC Engine Service Bulletin are not approved for use on the P.180 airplane.

1.5 MAXIMUM WEIGHTS

a. Maximum Ramp Weight — 11,600 LBS (5262 Kg.)

b. Maximum Takeoff Weight — 11,550 LBS (5239 Kg.)

c. Maximum Landing Weight — 10,945 LBS (4965 Kg.)

d. Maximum Zero Fuel Weight
   – S.N. 1004 to 1015 airplanes (linear interpolation between limits):
      At forward C.G. — 9500 LBS (4309 Kg.)
      At aft C.G. — 9300 LBS (4218 Kg.)
   – S.N. 1016 and up airplanes: — 9800 LBS (4445 Kg.)

e. Maximum Weight in Baggage Compartment — 400 LBS (181 Kg.)

NOTE

This is the maximum weight of baggage allowed in a fully available baggage compartment.
The installation of some optional equipments may require a partial utilization of the baggage compartment with a corresponding reduction of the above maximum weight allowed for baggage loading.

1.6 AIRPLANE WEIGHTS

a.	Typical Equipped Empty Weight	7,500 LBS (3266 Kg)
b.	Maximum Useful Load (standard airplane including ramp fuel)	4,230 LBS (1919 Kg)

NOTE

Refer to Section 6 for Empty Weight value and Useful Load value to be used for C.G. calculations of the airplane specified.

1.7 CABIN & ENTRY DIMENSIONS

a.	Cabin Length	19.68 FT (6.00 m.)
b.	Cabin Width	6.07 FT (1.85 m.)
c.	Cabin Height	5.74 FT (1.75 m.)
d.	Cabin Door Width	2.00 FT (0.61 m.)
e.	Cabin Door Height	4.43 FT (1.35 m.)

1.8 BAGGAGE SPACE & ENTRY DIMENSIONS

a.	Compartment Volume	44.15 cu.ft. (1.25 cu.m.)

NOTE

This is the volume of baggage allowed in a fully available baggage compartment.
The installation of some optional equipments may require a partial utilization of the baggage compartment with a corresponding reduction of the volume available for baggage stowing.

b.	Compartment Length	5.57 ft. (1.70 m.)
c.	Baggage Compartment Door Width	2.30 ft. (0.70 m.)
d.	Baggage Compartment Door Height	1.97 ft. (0.60 m.)

1.9 SPECIFIC LOADINGS

a.	Wing Loading	67.07 lbs. per sq. ft. 327.44 Kg. per sq.m.
b.	Power Loading	6.79 lbs. per hp 3.08 Kg. per hp

1.10 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

The following definitions are of symbols, abbreviations and terminology used throughout the handbook and those which may be of added operational significance to the pilot.

a. General Airspeed Terminology and Symbols

CAS	Calibrated Airspeed means the indicated speed of an aircraft, corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.
KCAS	Calibrated Airspeed expressed in "Knots".
GS	Ground Speed is the speed of an airplane relative to the ground
IAS	Indicated Airspeed is the speed of an aircraft as shown on the airspeed indicator when corrected for instrument error. IAS values published in this handbook assume zero instrument error.
KIAS	Indicated Airspeed expressed in "Knots".
M	Mach Number is the ratio of true airspeed to the speed of sound.
TAS	True Airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature and compressibility.
KTAS	True Airspeed expressed in "Knots".
V_A	Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.
V_{FE}	Maximum Flap Extended Speed is the highest speed permissible with flaps in a prescribed extended position.
V_{FO}	Maximum Flap Operating Speed is the maximum speed at which the flaps can be safely extended or retracted.
V_{LE}	Maximum Landing Gear Extended Speed is the maximum speed at which an aircraft can be safely flown with the landing gear extended.
V_{LLE}	Maximum Landing Light Extended Speed is the maximum speed at which the aircraft can be safely flown with the landing light extended.
V_{LO}	Maximum Landing Gear Operating Speed is the maximum speed at which the landing gear can be safely extended or retracted.
V_{MCA}	Air Minimum Control Speed is the minimum flight speed at which the airplane is directionally controllable as determined in accordance with Federal Aviation Regulations. Airplane certification conditions include one engine becoming inoperative and windmilling; not more than a 5° bank towards the operative engine; takeoff power on operative engine; landing gear up; flaps in takeoff position; and most rearward C.G.

$V_{MO/MMO}$	Maximum Operating Limit Speed is the speed limit that may not be deliberately exceeded in normal flight operations. V is expressed in knots and M in a mach number.
V_S	Stalling Speed or the minimum steady flight speed at which the airplane is controllable.
V_{SI}	Stalling speed or the minimum steady speed obtained in a specific configuration.
V_{SO}	Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration.
V_{SSE}	Intentional One Engine Inoperative Speed is a minimum speed selected by the manufacturer for intentionally rendering one engine inoperative in flight for pilot training.
V_X	Best Angle-of-Climb Speed is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
V_Y	Best Rate-of-Climb Speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time.

b. Meteorological Terminology

IOAT	Indicated Outside Air Temperature is the temperature indicated on the pilot's out side air temperature indicator. The indication is not adjusted for instrument error or temperature compressibility effects.
ISA	International Standard Atmosphere in which: 1. The air is a dry perfect gas; 2. The temperature at sea level is 15° Celsius (59° Fahrenheit); 3. The pressure at sea level is 29.92 inches hg. (1013.2 mb); 4. The temperature gradient from sea level to the altitude at which the temperature is – 56.5°C (– 69.7°F) is – 0.00198°C (– 0.003564°F) per foot and zero above that altitude.
OAT	Outside Air Temperature is the free air static temperature obtained either from inflight temperature indications or ground meteorological sources, adjusted for instrument error and compressibility effects.
Indicated Pressure Altitude	The number actually read from an altimeter when the barometric subscale has been set to 29.92 inches of mercury (1013.2 millibars).
Pressure Altitude	Altitude measured from standard sea-level pressure (29.92 in. Hg) by a pressure or barometric altimeter. It is the indicated pressure altitude corrected for position and instrument error. In this handbook, altimeter instrument errors are assumed to be zero.
Station Pressure	Actual atmospheric pressure at field elevation.
Wind	The wind velocities recorded as variables on the charts of this handbook are to be understood as the headwind or tailwind components of the reported winds.

c. Power Terminology

Takeoff Power	Maximum power permissible during takeoff
Maximum Continuous Power	Maximum power permissible for unrestricted periods of use.
Maximum Climb Power	Maximum power permissible during climb.
Maximum Cruise Power	Maximum power possible during cruise
Reverse Thrust	The thrust produced when the propeller blades are rotated past flat pitch into the beta range

d. Engine Controls and Instruments

Power Control Lever	The lever which modulates engine power from reverse thrust through takeoff power.
Condition Lever	The lever which requests the propeller governor to maintain propeller rpm at a selected value or feathers the propeller. The lever which controls fuel flow during engine start and selects ground idle and flight idle.
Propeller Governor	Maintains propeller rpm at selected value.
Overspeed Governor	Limits propeller speed to 104% of maximum limit in case of a propeller governor failure.
Beta Range	The region where the propeller blade angle is between the fine pitch stop and the maximum reverse pitch setting and is controlled by the power lever.
ITT Gauge	Inter-turbine temperature gauge-indicates temperature immediately upstream of the free turbine vanes.
Gas Generator RPM (N_G)	Indicates the percent of gas generator rpm
Propeller RPM (N_P)	Indicates propeller speed in rpm.
Engine Torquemeter	Indicates shaft output torque in lb-ft.

e. Airplane Performance and Flight Planning Terminology

Climb Gradient	The demonstrated ratio of the change in height during a portion of climb, to the horizontal distance traversed in the same time interval.
Demonstrated Crosswind Velocity	The demonstrated crosswind velocity is the velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests, but is not considered a limitation.
Accelerate-Stop Distance	The distance required to accelerate an airplane to a specified speed and, assuming failure of an engine at the instant that speed is attained, to bring the airplane to a stop.
Accelerate-Go Distance	The distance required to accelerate an airplane to a specified speed and, assuming failure of an engine at the instant that speed is attained, continue takeoff on the remaining engine to a height of 50 feet.
Route Segment	A part of a route. Each end of that part is identified by: (1) a geographical location; or (2) a point at which a definite radio fix can be established.

f. Weight and Balance Terminology

Reference Datum	An imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	A location along the airplane fuselage usually given in terms of distance in inches from the reference datum.
Arm	The horizontal distance from the reference datum to the center of gravity (C.G.) of an item.
Moment	The product of the weight of an item multiplied by its arm. (Moment divided by a constant is used to simplify balance calculations by reducing the number of digits).
Center of Gravity (C.G.)	The point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.
C.G. Arm	The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight of the airplane.
C.G. Limits	The extreme center of gravity locations within which the airplane must be operated at a given weight.
Usable Fuel	Fuel available for flight planning.
Unusable Fuel	Fuel remaining after a runout test has been completed in accordance with governmental regulations.

Standard Empty Weight	Weight of a standard airplane including unusable fuel, full operating fluids and full oil.
Basic Empty Weight	Standard empty weight plus optional equipment.
Payload	Weight of occupants, cargo and baggage.
Useful Load	Difference between takeoff weight or ramp weight if applicable, and basic empty weight. This includes payload and fuel.
Maximum Ramp Weight	Maximum weight approved for ground maneuver. (It includes weight of start, taxi and run up fuel.)
Maximum Takeoff Weight	Maximum weight approved for the start of the takeoff run
Maximum Landing Weight	Maximum weight approved for the landing touchdown.
Maximum Zero Fuel Weight	Maximum weight exclusive of usable fuel.

g. Cabin pressure control terminology

Atmospheric Pressure	Pressure surrounding the outside of the aircraft and into which primary and secondary outflow valves discharge cabin outflow.
Cabin Pressure	Pressure within the cabin that is maintained by the cabin pressure control system.
Cabin Altitude Control	An automatic operation performed by the cabin pressure controller.
Differential Pressure (Δp)	The difference in pressure between cabin pressure and atmospheric pressure.
Depressurization	The condition in which cabin altitude is rapidly raised. This emergency measure overrides all automatic functions without affecting the safety features of the outflow/safety valves.
Maximum Positive Differential Pressure Control	Pneumatic control of cabin pressure when cabin-to-atmosphere differential pressure exceeds the normal positive differential pressure setting of the controller logic. This function is controlled by the primary and secondary outflow/safety valves.
Minimum Differential Pressure Control	Minimum cabin-to-atmosphere differential pressure with the aircraft on the ground and the primary and secondary outflow/safety valves full-open.

Negative Differential Pressure Control	The pneumatic control of cabin pressure when atmospheric pressure exceeds cabin pressure. This condition can occur during rapid aircraft descent.
Normal Positive Differential Control	The control of cabin pressure when the cabin-to-atmosphere differential pressure exceeds the normal control value generated by the controller.
"PIP" Mark	Describes alignment of the arrowhead used to indicate the position of the rate selection (R) knob and the mark on the face of the cabin pressure selector.
Prepressurization	Control of cabin pressure to an altitude 150 feet below minimum differential pressure control. This is a control function established by throttle advancement for takeoff with the aircraft on the ground.
Rate-of-Change	The rate at which cabin altitude climbs or descends.
Reference Pressure	The pressure, retained in the primary and secondary outflow valve head chambers, established as a motivating force for valve movement.
Selected Altitude	The landing field altitude dialed on the cabin pressure selector with the use of cabin altitude selection (A) knob.
True Static Atmosphere	The true air pressure outside the aircraft provided to the system by a true static atmosphere pickup at a specific location on the aircraft.

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SECTION 2

LIMITATIONS

2.0 GENERAL

This section provides design limitations, operating limitations, instrument markings, color coding and basic placards necessary for operation of the airplane.
Compliance with the limitations of this section is required by regulation.

2.1 AIRSPEED LIMITATIONS

SPEED	KCAS	KIAS
DESIGN MANEUVERING SPEED – V_A		
Do not make full or abrupt control movements above this speed.		
11,550 lb.	198	199
7,700 lb.	176	177

NOTE

Linear interpolation may be used for intermediate gross weights.

MAXIMUM FLAP OPERATING SPEED – V_{FO}		
Do not extend or retract flap at the given setting above this speed.		
UP to MID	169	170
MID to DN	149	150
MAXIMUM FLAP EXTENDED SPEED – V_{FE}		
Do not exceed this speed at the given flap setting.		
Flap MID	179	180
Flap DN	173	175
MAXIMUM LANDING GEAR OPERATING SPEED – V_{LO}		
Do not extend or retract landing gear above this speed.	179	180
MAXIMUM LANDING GEAR EXTENDED SPEED – V_{LE}		
Do not exceed this speed with landing gear extended.	184	185
MAXIMUM LANDING LIGHT OPERATING SPEED – V_{LLO}		
Do not extend or retract landing light above this speed.	159	160
MAXIMUM LANDING LIGHT EXTENDED SPEED – V_{LLE}		
Do not exceed this speed with landing light extended.	159	160

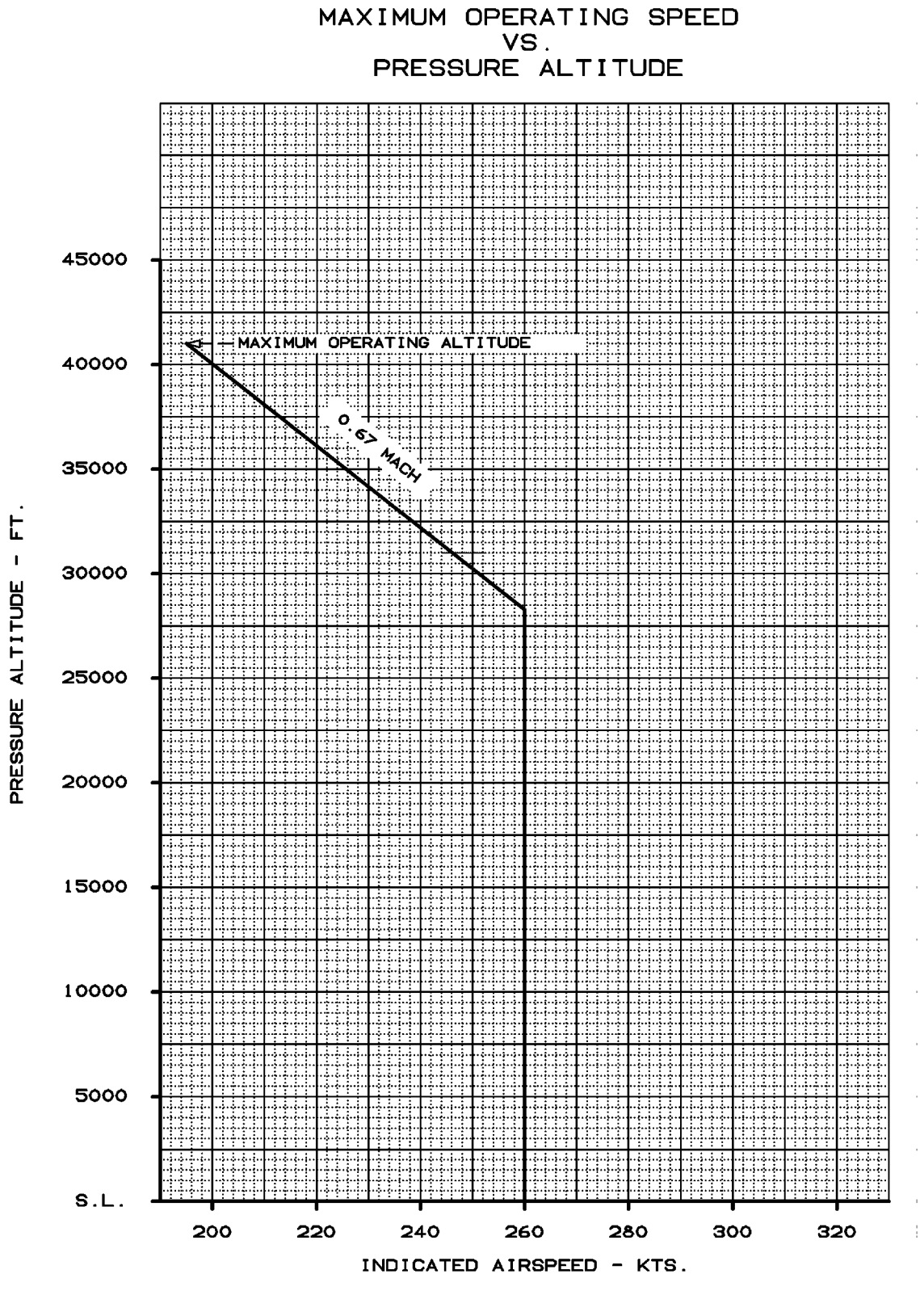

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Figure 2-1. MAXIMUM OPERATING SPEED

SPEED	KCAS	KIAS
AIR MINIMUM CONTROL SPEED – V_{MCA}		
This is the minimum flight speed at which the airplane is directionally and laterally controllable, determined in accordance with the Federal Aviation Regulations and Regolamento Tecnico R.A.I.		
Autofeather system operative (propeller feathered)	99	100
Propeller windmilling	127	128
MAXIMUM OPERATING SPEED LIMIT – V_{MO}/M_{MO}		
Do not exceed this airspeed in any operation. (See Figure 2-1 on page 2-2)	258/.665 Mach	260/.67 Mach

2.2 AIRSPEED INDICATOR MARKINGS

MARKING	SIGNIFICANCE	KIAS
Red Line	Maximum Operating Speed	260
Red and White Stripes Pointer	Maximum Operating Mach Number	.67
Red Line	Air Minimum Control Speed	100
White Arc	Full flap operating range Lower limit is maximum weight stalling speed in landing configuration. Upper limit is maximum speed permissible for operating flaps in landing configuration.	98 to 150
Blue Line	One Engine Inoperative Best Rate of Climb Speed	140

2.3 POWER PLANT LIMITATIONS

a. Number of Engines	2
b. Engine Manufacturer	Pratt & Whitney Canada
c. Engine Model Number	PT6A-66

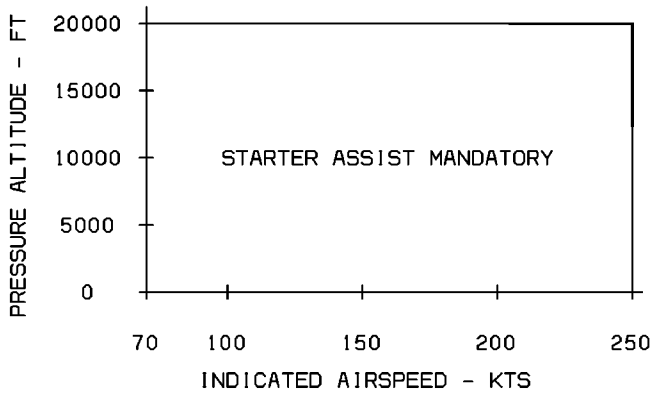
d. Engine Operating Limits

OPERATING CONDITION (1)		OPERATING LIMITS							
		TORQUE (2) LB-FT			MAXIMUM OBSERVED ITT°C	N_G % (7)	N_P RPM	OIL PRESSURE PSIG (3)	OIL TEMPERATURE °C (10) (11)
POWER SETTING	SHP	2000 RPM	1900 RPM	1800 RPM					
TAKEOFF	850	2230	–	–	830 (8)	104.1	2000	90 to 135	0 to 104
MAX. CONTINUOUS MAX. CLIMB AND MAX CRUISE	850	2230	–	–	830 (8)	104.1	2000	90 to 135	0 to 104
	806	–	2230	–					
	762	–	–	2230					
NORMAL CLIMB AND NORMAL CRUISE	850	2230	–	–	820 (8)	104.1	2000	90 to 135	Climb 0 to 104 Cruise 20 to 104
	806	–	2230	–					
	762	–	–	2230					
MIN. IDLE		–	–	–	750 (6)	51	–	60 (MIN)	– 40 to 110
STARTING		–	–	–	1000 (4)	–	–	200 (MAX)	– 40 (MIN)
TRANSIENT		2750 (5)	2750 (5)	2750 (5)	870 (5)	104.1	2205 (9)	40 to 200 (5)	0 to 110
MAX. REVERSE		–	–	–	760	–	1900	90 to 135	0 to 104

1. Engine inlet condition limits for engine operation: Altitude: – 1,000 to 41,000 feet.
2. Torque limit applies within a range of 1600 to 2000 propeller rpm; below 1600 rpm torque is limited to 1100 lb ft.
   Torquemeter - Power Calculations
   SHP = RPM (N_P) x torque (lb ft) x K
   Where: N_P = propeller RPM
   K = 0.00019

3. Normal oil pressure is 90 to 135 psig at gas generator speeds above 72% and with a normal oil temperature of 60 to 70°C (140 to 158°F). Oil pressures under 90 psig are undesirable. Under emergency conditions, to complete a flight, a lower oil pressure limit of 60 psig is permissible at reduced power settings not exceeding 1100 lb·ft torque. Oil pressures below 60 psig are unsafe and require that either the engine be shutdown or land as soon as practical using the minimum power required to sustain flight.
4. This value is time limited to 5 seconds.
5. These values are time limited to 20 seconds.
6. Applies to a speed range between 54% and 61% N_G.
7. 100% gas generator speed corresponds to 37,468 rpm.
   100% power turbine speed corresponds to 33,235 rpm.
8. The temperatures shown are the maximum ITTs permissible under the Certification limitations. For normal operations, power management during takeoff, climb and cruise as shown in the power setting tables of Section 5 should be observed for warranted engine life. However, lower temperatures (785°C for Takeoff Maximum Continuous Climb and Maximum Cruise) will produce rated horsepower (ISA) when the engine is new and result in longer engine life.
9. May be used in emergency conditions to complete the flight.
10. Oil temperature above 104°C or below 20°C must only be tolerated in accordance with the procedure contained in this manual.
11. For increased service life of engine oil, an oil temperature below 80°C (176°F) is recommended.
    A minimum oil temperature of 55°C (130°F) is recommended for fuel heater operation at takeoff power.

RECOMMENDED AIR START ENVELOPE
PROPELLER FEATHERED



Minimum N_G for airstart 13%

NOTE

Air start may be attempted outside of the envelope, or lower N_G provided ITT starting limit is monitored and not exceeded.

e. Generator Limits

Limit the load on each generator as follows, except during starting:

ALTITUDE (FT)	GEN. LOAD (AMPS)
On Ground	200
S.L. to 41,000	400

f. Fuel Specifications

JP-4, JP-8, Jet A, A-1 and Jet B fuels conforming to the latest revision of P&WC Service Bulletin No. 14004. It is not necessary to purge the unused fuel from the system when switching fuel types.
Aviation Gasoline is not permitted.

CAUTION

Fuel Anti-ice additive must be used as per the latest revision of P&WC Service Bulletin No. 14004 (including Phillips PFA 55 MB, MIL-I-27686D and MIL-I-27686E).
See Section 8 for blending instruction.
Some fuel suppliers blend anti-icing additive in their storage tanks. Prior to refueling check with the fuel supplier to determine if fuel has been blended. To assure proper concentration by volume of fuel on board, blend only enough additive for the unblended fuel.

g. Oil Specifications

Only MOBIL JET OIL II, AEROSHELL TURBINE OIL 500, CASTROL 5000 and EXXON TURBO OIL 2380 engine oils have been tested and are approved for use on the P.180 airplane within the recommendations of the latest revision of P&WC Engine Service Bulletin No. 14001.
The other oils listed in the above P&WC Engine Service Bulletin are not approved for use on the P.180 airplane.

h. Number of Propellers	2
i. Propeller Manufacturer	Hartzell
j. Propeller Hub Models	
Left (CW Rotating)	HC-E5N-3 or HC-E5N-3A
Right (CCW Rotating)	HC-E5N-3L or HC-E5N-3AL
k. Propeller Blade Models	
Left (CW Rotating, inner tip down)	HE8218
Right (CCW Rotating, inner tip down)	LE8218
l. Number of Blades	5
m. Propeller Diameter, nominal	85 in. (2.16 m.)
n. Propeller Blade Angles at 30 in. Station (nominal)	
Feathered	89°
Reverse	–13°

o. Propeller Speed (rpm)

Takeoff and Climb	2000
Cruise	1800/2000

WARNING

1. Stabilized ground operation below 900 RPM is prohibited, except when feathered operation at or below 600 RPM.
2. Stabilized ground operation between 1300 and 1600 RPM is prohibited.

CAUTION

Feather operation for training purposes should be limited to speeds below 150 KIAS.
Sustained ground operation (more than 30 minutes), especially at power settings higher than Ground Idle or with frequent application of power should be avoided.
Static operation at torque settings higher than 500 lb·ft must not last for more than 2 minutes, after that a cooling period of 20 minutes at Ground Idle or 10 minutes with engines OFF must be observed.

p. Autofeather System Limits

WARNING

No takeoff authorized with autofeather inoperative

1. The autofeather system must be pre flight checked operational prior to takeoff
2. The autofeather system must be used for takeoff and landing operations. It is recommended to disengage the autofeather system at speeds above 150 KIAS.

q. Use of the reverse thrust (condition levers fully forward).

WARNING

Positioning of power levers below the flight idle stop in flight is prohibited. Such positioning may lead to loss of airplane control or may result in an engine overspeed condition and consequent loss of engine power.

CAUTION

The reverse thrust must be initiated only after the propeller speed has dropped 5% from the set value (for example, 1900 RPM with condition lever at MAX RPM).
Use of reverse before the 5% propeller RPM drop may result in asymmetrical thrust.
Refer to Section 5 of this POH for recommended airspeed.
Ground static operation at full reverse power for more than 12 seconds is prohibited, to avoid propeller blade overtemperature.
Cool down 20 minutes at Ground Idle before repeating.

r. Power handling at altitude.
When flying above 30000 ft with two engines operating and one bleed OFF or one engine running at N_G lower than 86% and the other at full power, the power lever of the engine at zero bleed or at low power must be advanced slowly in the range from idle to 86% N_G.

2.4 STARTER LIMITATIONS

Use of the starters is limited to 50 seconds ON, three minutes OFF, 40 seconds ON, 30 minutes OFF before a further start may be attempted.
Starter operation is limited to 30 seconds if in the meantime at least 13% N_G is not reached.

2.5 POWER PLANT INSTRUMENT MARKINGS

a. Propeller Tachometer

Yellow Arc (Transient Operation Only)	600 to 900 RPM
Yellow Arc (Transient Operation Only)	1300 to 1600 RPM
Green Arc (Normal Operating Range)	1800 to 2000 RPM
Red Radial Line (Maximum)	2000 RPM

b. Gas Generator Tachometer

Blue Triangle	13%
Green Arc (Normal Operating Range)	51 to 104.1%
Red Radial Line (Maximum)	104.1%

c. Engine Torque

Green Arc (Normal Operating Range)	0 to 2230 LB•FT
Red Radial Line	2230 LB•FT
Red Triangle	2750 LB•FT

d. Oil Pressure

Red Radial Line (Minimum)	60 PSI
Yellow Arc (Caution)	60 to 90 PSI
Green Arc (Normal Operating Range	90 to 135 PSI

e. Oil Temperature

Amber Light illuminated (Caution Range)	0° to 20°C
Red and Amber Lights not illuminated (Normal Operating Range)	20° to 104°C
Red Light illuminated (Maximum)	110°C
Amber Light illuminated(Caution Range)	104° to 110°C

f. Inter Turbine Temperature (ITT)

Green Arc (Normal Operating Range)	200° to 830°C
Red Radial Line (Maximum)	830°C
Red Dot (Maximum on Starting)	1000°C

NOTE

See Engine Operating Limits for explanation of instrument markings.

2.6 SYSTEM INSTRUMENT MARKINGS

a. Cabin Altitude Differential Pressure Indicator

Green Arc (Normal Operating Range)	0 to 9.0 PSI
Yellow Arc (Caution)	9.0 to 9.7 PSI
Red Radial (Maximum)	9.7 PSI

b. Oxygen Pressure Gauge

Green Arc (Usable range)	250 to 1850 PSI
Yellow arc (Caution Empty)	0 to 250 PSI
Yellow arc (Caution Maximum)	1850 to 2000 PSI

c. Hydraulic System Pressure

Green Arc (Normal Operating Range)	0 to 3050 PSI
Yellow Arc (Caution)	3050 to 3600 PSI

o. Propeller Speed (rpm)

Takeoff and Climb	2000
Cruise	1800/2000

WARNING

1. Stabilized ground operation below 900 RPM is prohibited, except when feathered operation at or below 600 RPM.
2. Stabilized ground operation between 1300 and 1600 RPM is prohibited.

CAUTION

Feather operation for training purposes should be limited to speeds below 150 KIAS.
Sustained ground operation (more than 30 minutes), especially at power settings higher than Ground Idle or with frequent application of power should be avoided.
Static operation at torque settings higher than 500 lb·ft must not last for more than 2 minutes, after that a cooling period of 20 minutes at Ground Idle or 10 minutes with engines OFF must be observed.

p. Autofeather System Limits

WARNING

No takeoff authorized with autofeather inoperative.

1. The autofeather system must be pre flight checked operational prior to takeoff.
2. The autofeather system must be used for takeoff and landing operations. It is recommended to disengage the autofeather system at speeds above 150 KIAS.

q. Use of the reverse thrust (condition levers fully forward).

WARNING

Positioning of power levers below the flight idle stop in flight is prohibited. Such positioning may lead to loss of airplane control or may result in an engine overspeed condition and consequent loss of engine power.

CAUTION

The reverse thrust must be initiated only after the propeller speed has dropped 5% from the set value (for example, 1900 RPM with condition lever at MAX RPM).
Use of reverse before the 5% propeller RPM drop may result in asymmetrical thrust.
Refer to Section 5 of this POH for recommended airspeed.
Ground static operation at full reverse power for more than 12 seconds is prohibited, to avoid propeller blade overtemperature.
Cool down 20 minutes at Ground Idle before repeating.
Go-around after selecting reverse thrust on the ground is prohibited.

r. Power handling at altitude.
When flying above 30000 ft with two engines operating and one bleed OFF or one engine running at N_G lower than 86% and the other at full power, the power lever of the engine at zero bleed or at low power must be advanced slowly in the range from idle to 86% N_G.

2.4 STARTER LIMITATIONS

Use of the starters is limited to 50 seconds ON, three minutes OFF, 40 seconds ON, 30 minutes OFF before a further start may be attempted.
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Red Radial Line (Maximum)	2000 RPM

b. Gas Generator Tachometer

Blue Triangle	13%
Green Arc (Normal Operating Range)	51 to 104.1%
Red Radial Line (Maximum)	104.1%

c. Engine Torque

Green Arc (Normal Operating Range)	0 to 2230 LB•FT
Red Radial Line	2230 LB•FT
Red Triangle	2750 LB•FT

d. Oil Pressure

Red Radial Line (Minimum)	60 PSI
Yellow Arc (Caution)	60 to 90 PSI
Green Arc (Normal Operating Range	90 to 135 PSI

e. Oil Temperature

Amber Light illuminated (Caution Range)	0° to 20°C
Red and Amber Lights not illuminated (Normal Operating Range)	20° to 104°C
Red Light illuminated (Maximum)	110°C
Amber Light illuminated (Caution Range)	104° to 110°C

f. Inter Turbine Temperature (ITT)

Green Arc (Normal Operating Range)	200° to 830°C
Red Radial Line (Maximum)	830°C
Red Dot (Maximum on Starting)	1000°C

NOTE

See Engine Operating Limits for explanation of instrument markings.

2.6 SYSTEM INSTRUMENT MARKINGS

a. Cabin Altitude Differential Pressure Indicator

Green Arc (Normal Operating Range)	0 to 9.0 PSI
Yellow Arc (Caution)	9.0 to 9.7 PSI
Red Radial (Maximum)	9.7 PSI

b. Oxygen Pressure Gauge

Green Arc (Usable range)	250 to 1850 PSI
Yellow arc (Caution Empty)	0 to 250 PSI
Yellow arc (Caution Maximum)	1850 to 2000 PSI

c. Hydraulic System Pressure

Green Arc (Normal Operating Range)	0 to 3050 PSI
Yellow Arc (Caution)	3050 to 3600 PSI

d) Angle of Attack (Optional Instrument)

Green Arc (Normal Range)	0 to 0.6
Yellow Arc (Caution)	0.6 to 0.75
Red Arc (Stall)	0.75 to 1.0

e) Longitudinal Trim Indicator

Green Arc (Takeoff Range)	2 NU to 6 NU

2.7 WEIGHT LIMITS

It is the responsibility of the airplane owner and pilot to assure that the airplane is properly loaded. Maximum allowable weights are listed below. See "Weight and Balance" Section for loading instructions.

a)	Maximum Ramp Weight	11,600 LBS (5262 Kg.)
b)	Maximum Takeoff Weight	11,550 LBS (5239 Kg.)
c)	Maximum Landing Weight	10,945 LBS (4965 Kg.)
d)	Maximum Zero Fuel Weight	
	– S.N. 1004 to 1015 airplanes (linear interpolation between limits):	
	At forward C.G.	9500 LBS (4309 Kg.)
	At aft C.G.	9300 LBS (4218 Kg.)
	– S.N. 1016 and up airplanes:	9800 LBS (4445 Kg.)
e)	Maximum Weight in Rear Baggage Compartment	400 LBS (181 Kg.)
f)	Maximum Weight in Cabin Baggage Compartment	90 LBS (41 Kg.)
g)	Maximum Specific Load in Rear Baggage Compartment	50 LBS/SQ.FT. (244 Kg./sq.m.)
h)	Maximum Weight in Forward Cabinet (if installed)	34 LBS (15.4 Kg.)
i)	Maximum Weight in Refreshment Cabinets (if installed)	Refer to applicable Loading Chart at Section 6 "Weight and Balance"
j)	Maximum Weight in Pyramid Cabinet (each) (if installed)	10 LBS (4.5 Kg.)

2.8 CENTER OF GRAVITY LIMITS

Weight		Forward Limit	Rearward Limit
Pounds	Kilograms	Inches Aft of Datum	Inches Aft of Datum
11,600	5,262	207.80	214.00
8,745	3,967	195.22	214.00
8,500	3,856	194.00	213.00
7,700	3,493	194.00	209.80
6,000	2,722	194.00	209.80

NOTE

Straight line variation between points indicated.
The Datum Line is located 236.22 inches (6,000 millimeters) forward of the rear pressure bulkhead centerline (at the intersection between the forward pressure bulkhead and cockpit floor centerlines).

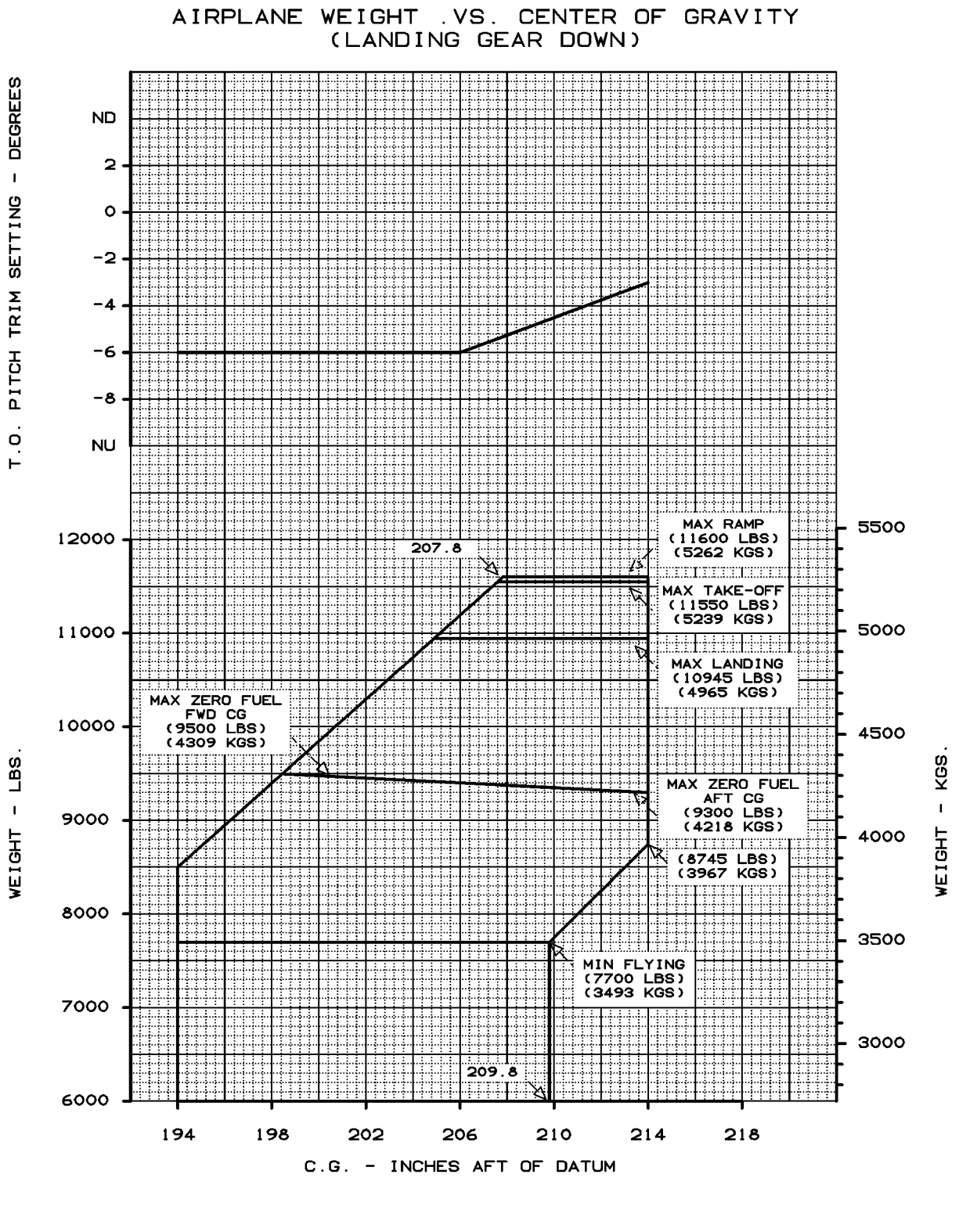

Figure 2-2/1. AIRPLANE WEIGHT VS. CENTER OF GRAVITY (S.N. 1004 TO 1015 AIRPLANES)

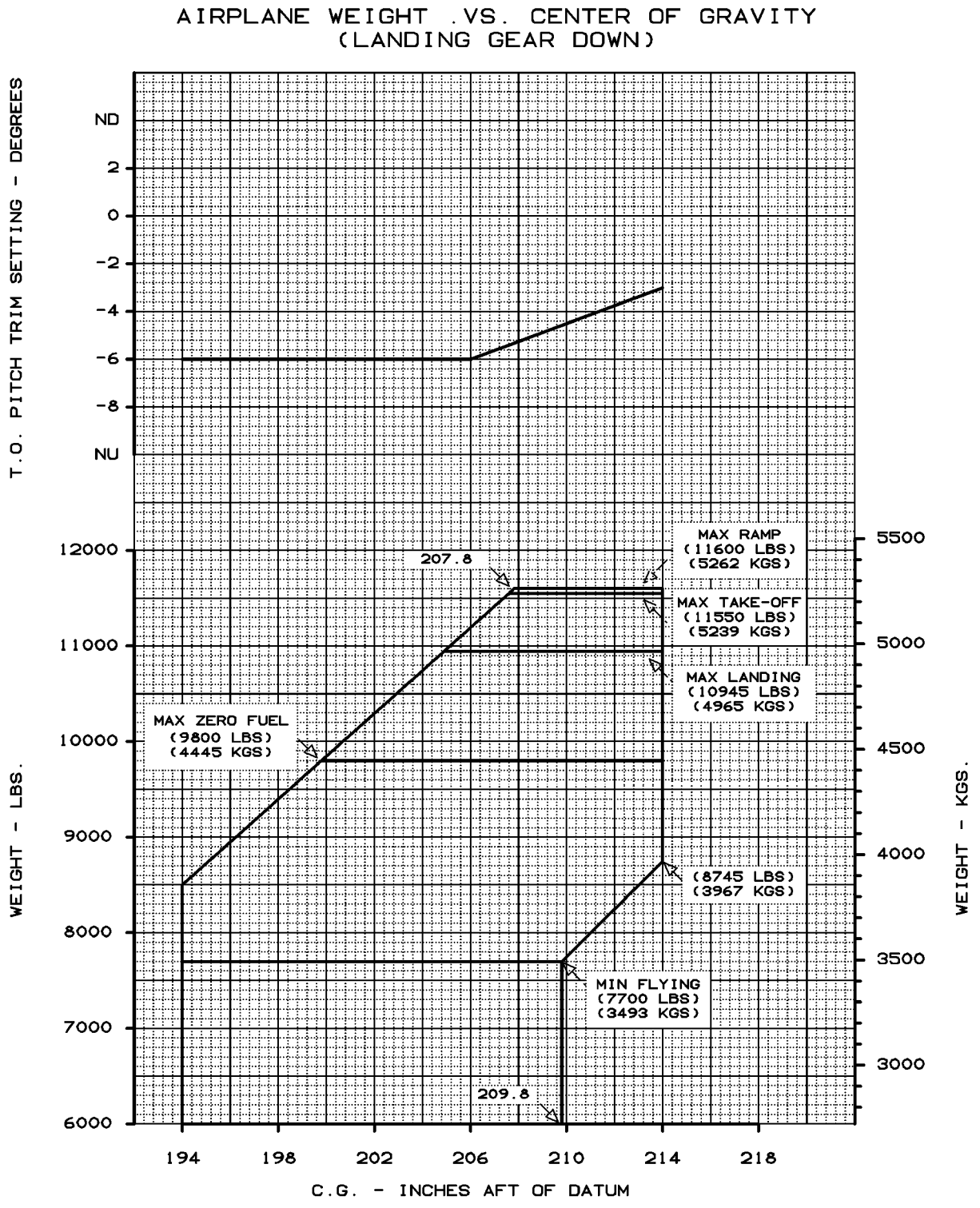

Figure 2-2/2. AIRPLANE WEIGHT VS. CENTER OF GRAVITY (S.N. 1016 AND UP AIRPLANES)

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2.9 MAXIMUM FUEL IMBALANCE

Maximum allowable fuel imbalance between wing fuel systems is 200 lbs.

2.10 MANEUVER LIMITS

This is a Normal Category Airplane, no acrobatic maneuvers, including spins, allowed.

2.11 FLIGHT LOAD FACTOR LIMITS (MANEUVERING)

a. Positive Load Factor (Flaps Up) 3.22 g
b. Negative Load Factor (Flaps Up) –1.29 g
c. Positive Load Factor (Flaps Down) 2.00 g

2.12 FLIGHT CREW LIMITS

Minimum crew (left seat) One Pilot

2.13 FUEL QUANTITY LIMITATIONS

1. Total Fuel Capacity
   - (S.N. 1004 to 1035 airplanes) 396.3 U.S. Gallons (1500 LTS)
   - (S.N. 1016 to 1035 with SB-80-0123 embodied and S.N. 1036 and up airplanes) 421.9 U.S. Gallons (1597 LTS)
2. Usable Fuel
   - Total Fuel System:
     - (S.N. 1004 to 1035 airplanes) 392.6 U.S. Gallons (1486 LTS)
     - (S.N. 1016 to 1035 with SB-80-0123 embodied and S.N. 1036 and up airplanes) 418.2 U.S. Gallons (1583 LTS)
   - Each Side Fuel System:
     - (S.N. 1004 to 1035 airplanes) 196.3 U.S. Gallons (743 LTS)
     - (S.N. 1016 to 1035 with SB-80-0123 embodied and S.N. 1036 and up airplanes) 209.1 U.S. Gallons (791.5 LTS)
3. Unusable Fuel
   - Total Fuel System 3.7 U.S. Gallons (14 LTS)
   - Each Side Fuel System 1.85 U.S. Gallons (7 LTS)

2.14 MAXIMUM OPERATING ALTITUDE LIMITS

1. Enroute 41,000 FT
2. Take off and Landing 10,000 FT

2.15 OUTSIDE AIR TEMPERATURE LIMITS

1. Minimum (Sea Level) -40°C (-40°F)
2. Minimum Temperature for Engine Starting:
   a. Engine Oil -40°C (-40°F)
   b. JP4, JET B Fuel -54°C (-65°F)
   c. JP8, JET A, JET A1 Fuel -34°C (-29°F)
3. Minimum Temperature for Takeoff -30°C (-22°F)
4. Maximum Sea level to 12000 ft pressure altd. ISA +35°C
   Above 12000 ft pressure altd. ISA +21°C

2.16 CABIN PRESSURIZATION LIMIT

Maximum Normal Cabin Differential Pressure	9.0 PSI
Maximum Cabin Differential Pressure	9.7 PSI

Do not land when airplane cabin is pressurized

2.17 MAXIMUM OCCUPANCY LIMITS

11 people including crew

2.18 SYSTEMS AND EQUIPMENT LIMITS

2.18.1 NICKEL-CADMIUM BATTERY LIMITATION

No battery engine starting must be attempted if the bus voltage is lower than 23.0 VDC or battery temperature is over 120°F (BAT TEMP caution light ON).
No takeoffs authorized with temperature indication over 150°F (BAT OVHT warning light ON).

2.18.2 FLAP SYSTEM LIMITATION

No takeoff authorized without flaps or with non symmetrical flap configuration or annunciated flap asymmetry.

Maximum operating altitude	20,000 ft.

2.18.3 HYDRAULIC PUMP

Operate continuously only with at least one engine running.
Hydraulic pump must be on and operating and nosewheel steering on and operating for single engine taxiing.

2.18.4 STEERING SYSTEM LIMITATION

Steering in TAXI position only for ground taxi.
Maximum Speed (in T.O. mode) 60 KTS
Steering engagement during landing is prohibited.

2.18.5 FUEL SYSTEM LIMITATION

Crossfeed operation is not approved for takeoff or landing.

2.9 MAXIMUM FUEL IMBALANCE

Maximum allowable fuel imbalance between wing fuel systems is 200 lbs.

2.10 MANEUVER LIMITS

This is a Normal Category Airplane, no acrobatic maneuvers, including spins, allowed.

2.11 FLIGHT LOAD FACTOR LIMITS (MANEUVERING)

a.	Positive Load Factor (Flaps Up)	3.22 g
b.	Negative Load Factor (Flaps Up)	–1.29 g
c.	Positive Load Factor (Flaps Down)	2.00 g
d.	Negative Load Factor (Flaps Down)	0.00 g

2.12 FLIGHT CREW LIMITS

Minimum crew (left seat) One Pilot

NOTE

The autopilot must be operative for IFR single pilot operations.

2.13 FUEL QUANTITY LIMITATIONS

1.	Total Fuel Capacity	
	(S.N. 1004 to 1035 airplanes)	396.3 U.S. Gallons (1500 LTS)
	(S.N. 1016 to 1035 with SB-80-0123 embodied and S.N. 1036 and up airplanes)	421.9 U.S. Gallons (1597 LTS)
2.	Usable Fuel	
	Total Fuel System:	
	(S.N. 1004 to 1035 airplanes)	392.6 U.S. Gallons (1486 LTS)
	(S.N. 1016 to 1035 with SB-80-0123 embodied and S.N. 1036 and up airplanes)	418.2 U.S. Gallons (1583 LTS)
	Each Side Fuel System:	
	(S.N. 1004 to 1035 airplanes)	196.3 U.S. Gallons (743 LTS)
	(S.N. 1016 to 1035 with SB-80-0123 embodied and S.N. 1036 and up airplanes)	209.1 U.S. Gallons (791.5 LTS)
3.	Unusable Fuel	
	Total Fuel System	3.7 U.S. Gallons (14 LTS)
	Each Side Fuel System	1.85 U.S. Gallons (7 LTS)

2.14 MAXIMUM OPERATING ALTITUDE LIMITS

1.	Enroute	41,000 FT
2.	Take off and Landing	10,000 FT

2.15 OUTSIDE AIR TEMPERATURE LIMITS

1.	Minimum (Sea Level)	-40°C (-40°F)
2.	Minimum Temperature for Engine Starting:	
	a. Engine Oil	-40°C (-40°F)
	b. JP4, JET B Fuel	-54°C (-65°F)
	c. JP8, JET A, JET A1 Fuel	-34°C (-29°F)
3.	Minimum Temperature for Takeoff	-30°C (-22°F)
4.	Maximum Sea level to 12000 ft pressure altd.	ISA +35°C
	Above 12000 ft pressure altd.	ISA +21°C

2.16 CABIN PRESSURIZATION LIMIT

Maximum Normal Cabin Differential Pressure	9.0 PSI
Maximum Cabin Differential Pressure	9.7 PSI

Do not land when airplane cabin is pressurized

2.17 MAXIMUM OCCUPANCY LIMITS

11 people including crew

2.18 SYSTEMS AND EQUIPMENT LIMITS

2.18.1 NICKEL-CADMIUM BATTERY LIMITATION

No battery engine starting must be attempted if the bus voltage is lower than 23.0 VDC or battery temperature is over 120°F (BAT TEMP caution light ON).
No takeoffs authorized with temperature indication over 150°F (BAT OVHT warning light ON).

2.18.2 FLAP SYSTEM LIMITATION

No takeoff authorized without flaps or with non symmetrical flap configuration or annunciated flap asymmetry.

Maximum operating altitude	20,000 ft.

2.18.3 HYDRAULIC PUMP

Operate continuously only with at least one engine running.
Hydraulic pump must be on and operating and nosewheel steering on and operating for single engine taxiing.

2.18.4 STEERING SYSTEM LIMITATION

Steering in TAXI position only for ground taxi.
Maximum Speed (in T.O. mode) 60 KTS
Steering engagement during landing is prohibited.

2.18.5 FUEL SYSTEM LIMITATION

Crossfeed operation is not approved for takeoff or landing.

2.18.6 MAXIMUM TIRE SPEED

The maximum tire speed is 154 KTS

2.18.7 CABIN ELECTRICAL POWER PROVISIONS

The use of auxiliary cabin electrical power sockets is subject to the manufacturer approval with reference to electrical loads, kind of operations, and compatibility of the connected equipment.

2.19 OPERATION ON UNPAVED RUNWAYS

When the airplane is equipped with the prescribed protection Kit, operations on unpaved runways are allowed under the limitations requirements, procedures, performance, weight & balance information presented in the Supplement No. 25 "Unpaved Runways Operations" at Section 9 of this Pilot's Operating Handbook.

2.20 COLD WEATHER OPERATION

If ambient temperature is below –25°C, it is necessary to operate the main wing anti-ice and the engine ice vane systems before applying full power to ensure that the autofeather is armed.

2.21 OPERATION IN ICING CONDITIONS

Landing must be performed with the flaps in MID position.

Minimum Ambient Temperature for operation of engine deicing boots –40°C

No takeoff authorized with frost, snow or ice adhering to the propellers, windshields, powerplant installation and pitot/static ports, or with snow or ice adhering to the wings, vertical and horizontal stabilizer or control surfaces.

2.22 NOISE LEVEL

FAR 36

The corrected noise level of the Piaggio P.180 aircraft according to FAR 36, Appendix F, amdt. 13, and Appendix G, amdt. 16, is respectively 76.0 dB(A) and 81.8 dB(A).

No determination has been made by the Registro Aeronautico Italiano/Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into or out of, any airport.

ICAO/Annex 16

The allowable noise level according to ICAO/Annex 16, Edit. 1988, Chap. 10, for the Piaggio P.180 aircraft at the max certificated TO weight is 88.0 dB(A). The corrected noise level determined according to the mentioned regulation is 86.4 dB(A).

2.23 KINDS OF OPERATIONS EQUIPMENT LIST (KOEL)

This airplane may be operated in day or night VFR, IFR and into known icing conditions when the appropriate equipment is installed and operable.

The following equipment list identifies the systems and equipment upon which type certification for each kind of operation was predicated. The systems and items of equipment listed must be installed and operable unless:

1. The airplane is approved to be operated in accordance with a current Minimum Equipment List (MEL) issued or approved by the Airworthiness Authority.

or:

2. An alternate procedure is provided in the Pilot's Operating Handbook and Approved Airplane Flight Manual for the inoperative state of the listed equipment and all limitations are complied with.

NOTE

The following systems and equipment list does not include all equipment required by the National Operating Regulations. It also does not include components obviously required for the airplane to be airworthy such as wings, empennage, engine, etc.

2.18.6 MAXIMUM TIRE SPEED

The maximum tire speed is 154 KTS

2.18.7 CABIN ELECTRICAL POWER PROVISIONS

The use of auxiliary cabin electrical power sockets is subject to the manufacturer approval with reference to electrical loads, kind of operations, and compatibility of the connected equipment.

2.19 OPERATION ON UNPAVED RUNWAYS

NOTE

Operation on unpaved surfaces is prohibited.

2.20 COLD WEATHER OPERATION

If ambient temperature is below –25°C, it is necessary to operate the main wing anti-ice and the engine ice vane systems before applying full power to ensure that the autofeather is armed.

2.21 OPERATION IN ICING CONDITIONS

Landing must be performed with the flaps in MID position.

Minimum Ambient Temperature for operation of engine deicing boots –40°C

No takeoff authorized with frost, snow or ice adhering to the propellers, windshields, powerplant installation and pitot/static ports, or with snow or ice adhering to the wings, vertical and horizontal stabilizer or control surfaces.

2.22 NOISE LEVEL

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No determination has been made by the Registro Aeronautico Italiano/Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into or out of, any airport.

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2.23 KINDS OF OPERATIONS EQUIPMENT LIST (KOEL)

This airplane may be operated in day or night VFR, IFR and into known icing conditions when the appropriate equipment is installed and operable.

The following equipment list identifies the systems and equipment upon which type certification for each kind of operation was predicated. The systems and items of equipment listed must be installed and operable unless the KOEL is provided in the Pilot's Operating Handbook and Approved Airplane Flight Manual for the inoperative state of the listed equipment and all limitations are complied with.

NOTE

The following systems and equipment list does not include all equipment required by the National Operating Regulations. It also does not include components obviously required for the airplane to be airworthy such as wings, empennage, engine, etc.

SYSTEM and/or COMPONENT	Number of items installed	VFR Day	VFR Night	IFR Day	IFR Night	Known Icing Conditions	REMARKS and/or EXCEPTIONS
ATA 100 CHAPTER 21 *AIR CONDITIONING*							
L/R Bleed Air Valves	2	2	2	2	2	2	
Pressurization Controller, Auto	1	1	1	1	1	1	
Safety Valve	1	1	1	1	1	1	
Outflow Valve	1	1	1	1	1	1	
Cab Press - Altitude Warning	1	1	1	1	1	1	
Cabin Rate of Climb	1	1	1	1	1	1	
Pressurization Air Source	2	2	2	2	2	2	
Pressurization Control, Manual	1	1	1	1	1	1	
Suction Source	1	1	1	1	1	1	
Door Seal Caution Light	1	1	1	1	1	1	
ATA 100 CHAPTER 22 *AUTO FLIGHT*							
Autopilot	1	-	-	-	-	-	
ATA 100 CHAPTER 23 *COMMUNICATIONS*							
VHF Communications System	2	1	1	2	2	2	
Static Discharge Wicks	16	7(1)	7(1)	7(1)	7(1)	7(1)	(1) Minimum required: one at the outboard end of each control surface.
ATA 100 CHAPTER 24 *ELECTRICAL POWER*							
Battery	1	1	1	1	1	1	
Battery Temperature Light	2	2	2	2	2	2	
DC Generator	2	2	2	2	2	2	
DC Generator Caution Light	2	2	2	2	2	2	
DC Distribution Busses Caution Light	1	1	1	1	1	1	
MFDI (Ammeter, Buss Volt, OAT, Batt Temp)	1	1	1	1	1	1	– All functions of the MFDI must be operating.
Inverter	2	2	2	2	2	2	
Inverter Caution Light	2	2	2	2	2	2	
ATA 100 CHAPTER 26 *FIRE PROTECTION*							
Fire Detector System	2	2	2	2	2	2	

SYSTEM and/or COMPONENT	Number of items installed	VFR Day	VFR Night	IFR Day	IFR Night	Known Icing Conditions	REMARKS and/or EXCEPTIONS
ATA 100 CHAPTER 27							
FLIGHT CONTROLS							
Trim Actuator	3	3	3	3	3	3	
Trim Indicator - Rudder, Aileron, and Horizontal Stabilizer	3	3	3	3	3	3	
Flap Position Indicator	1	1	1	1	1	1	
Flap System	1	1	1	1	1	1	
Stall Warning System	1	1	1	1	1	1	
ATA 100 CHAPTER 28							
FUEL EQUIPMENT							
Main Fuel Boost Pump	2	2	2	2	2	2	
Standby Fuel Boost Pump	2	2	2	2	2	2	
Firewall Shutoff Valve	2	2	2	2	2	2	
Fuel Quantity Indicator	2	2	2	2	2	2	
Firewall Shutoff Lights	4	4	4	4	4	4	
Crossfeed Valve	1	1	1	1	1	1	
Crossfeed Lights	2	2	2	2	2	2	
Fuel Flow Indicator	2	2	2	2	2	2	
Fuel Pressure Warning Light	2	2	2	2	2	2	
ATA 100 CHAPTER 30							
ICE AND RAIN PROTECTION							
Engine Inlet Deicer System	2	2	2	2	2	2	
Engine Inlet Deicer Light	2	2	2	2	2	2	
Engine Inertial Ice Vanes	2	2	2	2	2	2	
Ice Vane/Oil Inlet Heating Lights	2	2	2	2	2	2	
Windshield Heat, Left and Right	2	2	2	2	2	2	
Pitot and Static Heater	2	-	-	2	2	2	
Ice Detector & Lights Monitoring System	1	-	-	1	1	1	
Stall Warning Heater	1	-	-	1	1	1	
Main Wing Anti-ice System	2	-	-	-	-	2	
Main Wing Anti-ice Lights	4	-	-	-	-	4	
Forward Wing Anti-ice System	2	-	-	-	-	2	
Forward Wing Anti-ice Lights	4	-	-	-	-	4	
Main Wing Inspection Light	1	-	-	-	-	1	

SYSTEM and/or COMPONENT	Number of items installed	VFR Day	VFR Night	IFR Day	IFR Night	Known Icing Conditions	REMARKS and/or EXCEPTIONS
ATA 100 CHAPTER 21 *AIR CONDITIONING*							
L/R Bleed Air Valves	2	2	2	2	2	2	
Pressurization Controller, Auto	1	1	1	1	1	1	
Safety Valve	1	1	1	1	1	1	
Outflow Valve	1	1	1	1	1	1	
Cab Press - Altitude Warning	1	1	1	1	1	1	
Cabin Rate of Climb	1	1	1	1	1	1	
Pressurization Air Source	2	2	2	2	2	2	
Pressurization Control, Manual	1	1	1	1	1	1	
Suction Source	1	1	1	1	1	1	
Door Seal Caution Light	1	1	1	1	1	1	
ATA 100 CHAPTER 22 *AUTO FLIGHT*							
Autopilot	1	-	-	-	-	-	
ATA 100 CHAPTER 23 *COMMUNICATIONS*							
VHF Communications System	2	1	1	2	2	2	
Static Discharge Wicks	16	7(1)	7(1)	7(1)	7(1)	7(1)	(1) Minimum required: one at the outboard end of each control surface.
ATA 100 CHAPTER 24 *ELECTRICAL POWER*							
Battery	1	1	1	1	1	1	
Battery Temperature Light	2	2	2	2	2	2	
DC Generator	2	2	2	2	2	2	
DC Generator Caution Light	2	2	2	2	2	2	
DC Distribution Busses Caution Light	1	1	1	1	1	1	
MFDI (Ammeter, Buss Volt, OAT, Batt Temp)	1	1	1	1	1	1	– All functions of the MFDI must be operating.
Inverter	2	2	2	2	2	2	
Inverter Caution Light	2	2	2	2	2	2	
ATA 100 CHAPTER 26 *FIRE PROTECTION*							
Fire Detector System	2	2	2	2	2	2	

SYSTEM and/or COMPONENT	Number of items installed	VFR Day	VFR Night	IFR Day	IFR Night	Known Icing Conditions	REMARKS and/or EXCEPTIONS
ATA 100 CHAPTER 27							
FLIGHT CONTROLS							
Trim Actuator	3	3	3	3	3	3	
Trim Indicator - Rudder, Aileron, and Horizontal Stabilizer	3	3	3	3	3	3	
Flap Position Indicator	1	1	1	1	1	1	
Flap System	1	1	1	1	1	1	
Stall Warning System	1	1	1	1	1	1	
ATA 100 CHAPTER 28							
FUEL EQUIPMENT							
Main Fuel Boost Pump	2	2	2	2	2	2	
Standby Fuel Boost Pump	2	2	2	2	2	2	
Firewall Shutoff Valve	2	2	2	2	2	2	
Fuel Quantity Indicator	2	2	2	2	2	2	
Firewall Shutoff Lights	4	4	4	4	4	4	
Crossfeed Valve	1	1	1	1	1	1	
Crossfeed Lights	2	2	2	2	2	2	
Fuel Flow Indicator	2	2	2	2	2	2	
Fuel Pressure Warning Light	2	2	2	2	2	2	
ATA 100 CHAPTER 30							
ICE AND RAIN PROTECTION							
Engine Inlet Deicer System	2	2	2	2	2	2	
Engine Inlet Deicer Light	2	2	2	2	2	2	
Engine Inertial Ice Vanes	2	2	2	2	2	2	
Ice Vane/Oil Inlet Heating Lights	2	2	2	2	2	2	
Windshield Heat, Left and Right	2	2	2	2	2	2	– Right side may be inoperative.
Pitot and Static Heater	2	-	-	2	2	2	
Ice Detector & Lights Monitoring System	1	-	-	1	1	1	
Stall Warning Heater	1	-	-	1	1	1	
Main Wing Anti-ice System	2	-	-	-	-	2	
Main Wing Anti-ice Lights	4	-	-	-	-	4	
Forward Wing Anti-ice System	2	-	-	-	-	2	
Forward Wing Anti-ice Lights	4	-	-	-	-	4	
Main Wing Inspection Light	1	-	-	-	-	1	

SYSTEM and/or COMPONENT	Number of items installed	VFR Day	VFR Night	IFR Day	IFR Night	Known Icing Conditions	REMARKS and/or EXCEPTIONS
ATA 100 CHAPTER 21 *AIR CONDITIONING*							
L/R Bleed Air Valves	2	2	2	2	2	2	
Pressurization Controller, Auto	1	1	1	1	1	1	
Safety Valve	1	1	1	1	1	1	
Outflow Valve	1	1	1	1	1	1	
Cab Press - Altitude Warning	1	1	1	1	1	1	
Cabin Rate of Climb	1	1	1	1	1	1	
Pressurization Air Source	2	2	2	2	2	2	
Pressurization Control, Manual	1	1	1	1	1	1	
Suction Source	1	1	1	1	1	1	
Door Seal Caution Light	1	1	1	1	1	1	
ATA 100 CHAPTER 22 *AUTO FLIGHT*							
Autopilot	1	-	-	1	1	1	– For single pilot operations
ATA 100 CHAPTER 23 *COMMUNICATIONS*							
VHF Communications System	2	1	1	2	2	2	
Static Discharge Wicks	16	7(1)	7(1)	7(1)	7(1)	7(1)	(1) Minimum required: one at the outboard end of each control surface.
ATA 100 CHAPTER 24 *ELECTRICAL POWER*							
Battery	1	1	1	1	1	1	
Battery Temperature Light	2	2	2	2	2	2	
DC Generator	2	2	2	2	2	2	
DC Generator Caution Light	2	2	2	2	2	2	
DC Distribution Busses Caution Light	1	1	1	1	1	1	
MFDI (Ammeter, Buss Volt, OAT, Batt Temp)	1	1	1	1	1	1	– All functions of the MFDI must be operating.
Inverter	2	2	2	2	2	2	
Inverter Caution Light	2	2	2	2	2	2	
ATA 100 CHAPTER 26 *FIRE PROTECTION*							
Fire Detector System	2	2	2	2	2	2	

SYSTEM and/or COMPONENT	Number of items installed	VFR Day	VFR Night	IFR Day	IFR Night	Known Icing Conditions	REMARKS and/or EXCEPTIONS
ATA 100 CHAPTER 27							
FLIGHT CONTROLS							
Trim Actuator	3	3	3	3	3	3	
Trim Indicator - Rudder, Aileron, and Horizontal Stabilizer	3	3	3	3	3	3	
Flap Position Indicator	1	1	1	1	1	1	
Flap System	1	1	1	1	1	1	
Stall Warning System	1	1	1	1	1	1	
ATA 100 CHAPTER 28							
FUEL EQUIPMENT							
Main Fuel Boost Pump	2	2	2	2	2	2	
Standby Fuel Boost Pump	2	2	2	2	2	2	
Firewall Shutoff Valve	2	2	2	2	2	2	
Fuel Quantity Indicator	2	2	2	2	2	2	
Firewall Shutoff Lights	4	4	4	4	4	4	
Crossfeed Valve	1	1	1	1	1	1	
Crossfeed Lights	2	2	2	2	2	2	
Fuel Flow Indicator	2	2	2	2	2	2	
Fuel Pressure Warning Light	2	2	2	2	2	2	
ATA 100 CHAPTER 30							
ICE AND RAIN PROTECTION							
Engine Inlet Deicer System	2	2	2	2	2	2	
Engine Inlet Deicer Light	2	2	2	2	2	2	
Engine Inertial Ice Vanes	2	2	2	2	2	2	
Ice Vane/Oil Inlet Heating Lights	2	2	2	2	2	2	
Windshield Heat, Left and Right	2	2	2	2	2	2	
Pitot and Static Heater	2	-	-	2	2	2	
Ice Detector & Lights Monitoring System	1	-	-	1	1	1	
Stall Warning Heater	1	-	-	1	1	1	
Main Wing Anti-ice System	2	-	-	-	-	2	
Main Wing Anti-ice Lights	4	-	-	-	-	4	
Forward Wing Anti-ice System	2	-	-	-	-	2	
Forward Wing Anti-ice Lights	4	-	-	-	-	4	
Main Wing Inspection Light	1	-	-	-	-	1	

SYSTEM and/or COMPONENT	Number of items installed VFR Day	VFR Night	IFR Day	IFR Night	Known Icing Conditions	REMARKS and/or EXCEPTIONS
ATA 100 CHAPTER 31 *INDICATING/RECORDING SYSTEMS*							
Aural Warning System	1	1	1	1	1	1	
Annunciator System	1	1	1	1	1	1	
ATA 100 CHAPTER 32 *LANDING GEAR*							
Hydraulic Power Unit	1	1	1	1	1	1	
Pressure Monitoring Unit	1	1	1	1	1	1	
Landing Gear Position Indication Lights	3	3	3	3	3	3	
Steering Fail Light	1	1	1	1	1	1	
Hydraulic Press. Gauge	1	1	1	1	1	1	
Steering Taxi Light	1	1	1	1	1	1	
Steering Takeoff Light	1	1	1	1	1	1	
ATA 100 CHAPTER 33 *LIGHTS*							
Cockpit Lights	2	-	1	1	1	1	
Instrument Light System	1	-	1	1	1	1	
Taxi Light	1	-	1	-	1	1	
Landing Light	2	-	2	-	2	2	
Anticollision Strobe Light	2	-	2	-	2	2	
Position Light	4	-	4	-	4	4	
Passenger Notice System (Fasten Seat Belt and No Smoking)	1	1	1	1	1	1	
Cabin Door Warning Light	1	1	1	1	1	1	
Baggage Door Warning Light	1	1	1	1	1	1	
Portable Flash Light	1	-	1	-	1	1	
ATA 100 CHAPTER 34 *NAVIGATION INSTRUMENTS*							
Sensitive Altimeter	2	1(1)	1(1)	2	2	2	(1) On Pilot's Panel
Airspeed Indicator	2	1(1)	1(1)	2	2	2	
Vertical Speed Indicator	2	-	-	2	2	2	

SYSTEM and/or COMPONENT	Number of items installed	VFR Day	VFR Night	IFR Day	IFR Night	Known Icing Conditions	REMARKS and/or EXCEPTIONS
ATA 100 CHAPTER 34 *(Continued)*							
Magnetic Compass	1	1	1	1	1	1	
Horizon Indicator	3	2 (1)	2 (1)	3	3	3	(1) On Pilot's Panel
Compass System	2	1 (1)	1 (1)	2	2	2	
Clock	1	1	1	1	1	1	
Transponder	2	1	1	1	1	1	
VOR/ILS	2	1	1	2	2	2	
Marker Beacon	1	-	-	1	1	1	
DME	1	-	-	1	1	1	
ADF	1	-	-	1	1	1	
RMI	2	-	-	1	1	1	
ATA 100 CHAPTER 35 *OXYGEN*							
Oxygen System	1	1	1	1	1	1	
ATA 100 CHAPTER 61 *PROPELLERS*							
Propel. Primary Low Pitch Stop	2	2	2	2	2	2	
Propeller Overspeed Governor	2	2	2	2	2	2	
Overspeed Governor Test Switch	2	2	2	2	2	2	
Autofeathering System	2	2	2	2	2	2	
Autofeathering Armed Light	2	2	2	2	2	2	
Autofeathering Not Armed Light	1	1	1	1	1	1	
ATA 100 CHAPTER 77 *ENGINE INDICATING INSTRUMENTS*							
Propeller Tachometer Indicator	2	2	2	2	2	2	
Gas Gener. Tachometer Indicator	2	2	2	2	2	2	
ITT Indicator	2	2	2	2	2	2	
Torque Indicator	2	2	2	2	2	2	
ATA 100 CHAPTER 79 *ENGINE OIL INDICATORS*							
Oil Pressure Indicator	2	2	2	2	2	2	
Oil Temperature Indicator	2	2	2	2	2	2	

SYSTEM and/or COMPONENT	Number of items installed VFR Day	VFR Night	IFR Day	IFR Night	Known Icing Conditions	REMARKS and/or EXCEPTIONS
ATA 100 CHAPTER 31 *INDICATING/RECORDING SYSTEMS*							
Aural Warning System	1	1	1	1	1	1	
Annunciator System	1	1	1	1	1	1	
ATA 100 CHAPTER 32 *LANDING GEAR*							
Hydraulic Power Unit	1	1	1	1	1	1	
Pressure Monitoring Unit	1	1	1	1	1	1	
Landing Gear Position Indication Lights	3	3	3	3	3	3	
Steering Fail Light	1	1	1	1	1	1	
Hydraulic Press. Gauge	1	1	1	1	1	1	
Steering Taxi Light	1	1	1	1	1	1	
Steering Takeoff Light	1	1	1	1	1	1	
ATA 100 CHAPTER 33 *LIGHTS*							
Cockpit Lights	2	-	1	1	1	1	
Instrument Light System	1	-	1	1	1	1	
Taxi Light	1	-	1	-	1	1	
Landing Light	2	-	2	-	2	2	
Anticollision Strobe Light	2	-	2	-	2	2	
Position Light	4	-	4	-	4	4	
Passenger Notice System (Fasten Seat Belt and No Smoking)	1	1	1	1	1	1	
Cabin Door Warning Light	1	1	1	1	1	1	
Baggage Door Warning Light	1	1	1	1	1	1	
Portable Flash Light	1	-	1	-	1	1	
ATA 100 CHAPTER 34 *NAVIGATION INSTRUMENTS*							
Sensitive Altimeter	2	1(1)	1(1)	2	2	2	(1) Right side may be inoperative
Airspeed Indicator	2	1(1)	1(1)	2	2	2	
Vertical Speed Indicator	2	-	-	2	2	2	– Right side may be inoperative

SYSTEM and/or COMPONENT	Number of items installed	VFR Day	VFR Night	IFR Day	IFR Night	Known Icing Conditions	REMARKS and/or EXCEPTIONS
ATA 100 CHAPTER 34 *(Continued)*							
Magnetic Compass	1	1	1	1	1	1	
Horizon Indicator	3	2 (1)	2 (1)	3	3	3	(1) Right side may be inoperative
Compass System	2	1 (1)	1 (1)	2	2	2	
Clock	1	1	1	1	1	1	
Transponder	2	1	1	1	1	1	
VOR/ILS	2	1	1	2	2	2	
Marker Beacon	1	-	-	1	1	1	
DME	1	-	-	1	1	1	
ADF	1	-	-	1	1	1	
RMI	2	-	-	1	1	1	
ATA 100 CHAPTER 35 *OXYGEN*							
Oxygen System	1	1	1	1	1	1	
ATA 100 CHAPTER 61 *PROPELLERS*							
Propel. Primary Low Pitch Stop	2	2	2	2	2	2	
Propeller Overspeed Governor	2	2	2	2	2	2	
Overspeed Governor Test Switch	2	2	2	2	2	2	
Autofeathering System	2	2	2	2	2	2	
Autofeathering Armed Light	2	2	2	2	2	2	
Autofeathering Not Armed Light	1	1	1	1	1	1	
ATA 100 CHAPTER 77 *ENGINE INDICATING INSTRUMENTS*							
Propeller Tachometer Indicator	2	2	2	2	2	2	
Gas Gener. Tachometer Indicator	2	2	2	2	2	2	
ITT Indicator	2	2	2	2	2	2	
Torque Indicator	2	2	2	2	2	2	
ATA 100 CHAPTER 79 *ENGINE OIL INDICATORS*							
Oil Pressure Indicator	2	2	2	2	2	2	
Oil Temperature Indicator	2	2	2	2	2	2	

2.24 PLACARDS

NOTE

In addition and close to the standard (English language) passenger-addressed placards listed below, directly-translated placards in the language of the country in which the airplane is registered can be installed, if required by the specific country's regulation.

On the left side of the instrument panel:

THE MARKINGS AND PLACARDS INSTALLED IN THIS AIRPLANE CONTAIN OPERATING LIMITATIONS WHICH MUST BE COMPLIED WITH WHEN OPERATING THIS AIRPLANE IN THE NORMAL CATEGORY. OTHER OPERATING LIMITATIONS WHICH MUST BE COMPLIED WITH WHEN OPERATING THIS AIRPLANE IN THIS CATEGORY ARE CONTAINED IN THE AIRPLANE FLIGHT MANUAL.

THIS AIRPLANE IS APPROVED FOR VFR-IFR-DAY AND NIGHT OPERATION AND KNOWN ICING CONDITIONS.

NO ACROBATIC MANEUVERS, INCLUDING SPINS, APPROVED.

Close to the pressurization parameters gauges:

AIRCRAFT NOT APPROVED FOR LANDING WHEN PRESSURIZED

Close to the left Mach/Airspeed Indicator:

MAXIMUM SPEED – KIAS

DESIGN MANEUVERING

V_A = 199 AT 11550 LBS

V_A = 177 AT 7700 LBS

FLAP OPERATING

V_{FO} = 170 UP/MID/UP

V_{FO} = 150 MID/DN/MID

FLAP EXTENDED DN V_{FE} = 175

LDG GEAR OPERAT V_{LO} = 180

STEERING V = 60

On both the rudder pedal adjustment control handles:

RUDDER PEDAL ADJ

On the Control Pedestal:

EMERGENCY LANDING GEAR EXTENSION

1. **GEAR SELECTOR - DOWN**
2. **HYDRAULIC PUMP SWITCH - OFF**
3. **EMERG LDG SELECTOR - PULL**
4. **HAND PUMP - OPERATE UNTIL 3 GREEN LIGHTS COME ON (ABOUT 60 STROKES REQUIRED)**

Close to the power levers:

REVERSE ONLY WITH ENGINES RUNNING

ENGAGE REVERSE BELOW 1900 PROP. RPM

On the center post, close to the magnetic compass::

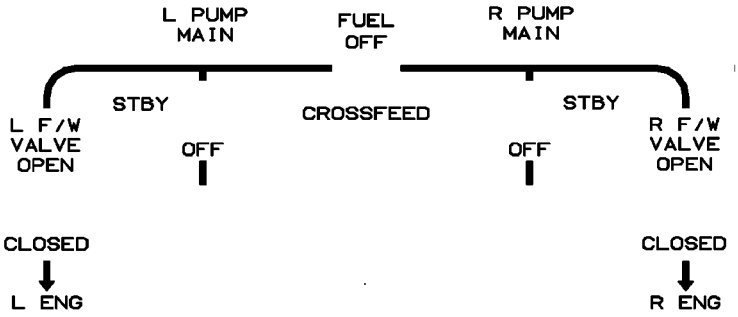
CAUTION

STANDBY COMPASS ERRATIC WHEN WINDSHIELD, PITOT/ STATIC, FW WING HEATING OR LANDING LIGHTS ARE ON

Close to the fuel quantity gauges:

USABLE FUEL 1315 LBS EACH TANK (S.N. 1004 to 1035 airplanes)

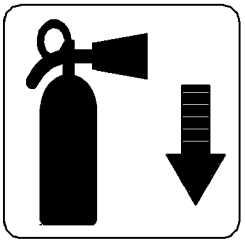
USABLE FUEL 1401 LBS EACH TANK (S.N. 1016 to 1035 with SB-80-0123 embodied and S.N. 1036 and up airplanes)



If portable fire extinguisher is installed:

On fire extinguisher cabinet:

On pilot partition:



Near each oxygen panel or plug:

WARNING: DO NOT SMOKE WHILE OXYGEN IS IN USE

Near the emergency exit:

E X I T

Close to the red emergency exit door handle (S.N. 1004 to 1033 airplanes):

E X I T – P U L L

On the red emergency exit door handle (S.N. 1034 and up airplanes):

E X I T
PULL AND TURN LEFT

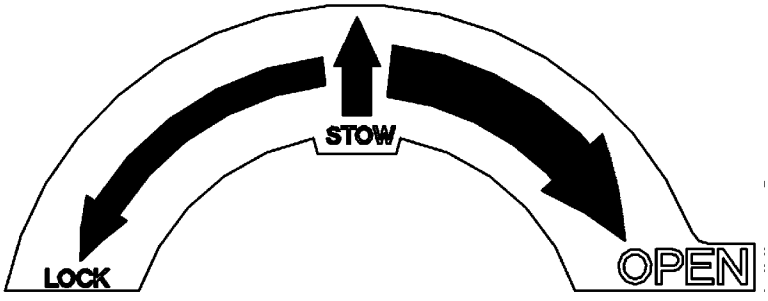
On the rearward place of the 2-place sidefacing divan, when the P/N 160057-6 divan (low back) is installed.
No placards and no seating limitations when the 2-place sidefacing divans P/N 160057-7, 160057-8, 160079-2 and 160079-3, provided with high back, are installed.

THIS SEAT MUST NOT
BE OCCUPIED DURING
TAKE-OFF AND LANDING

Near the passenger door:

E X I T

Close to the passenger upper door handle:



Close to the passenger bottom door handle:
(each side of the handle):

OPEN CLOSED

Near each swivel forward facing seat:

**SEAT MUST BE OUTBOARD
WITH SEATBACK IN UPRIGHT POSITION
FOR TAKE-OFF AND LANDING**

Near each swivel aft facing seat:

**SEAT MUST BE OUTBOARD
WITH SEATBACK IN UPRIGHT POSITION
AND HEADREST UP
FOR TAKE-OFF AND LANDING**

On each folding work table:

LEAF MUST BE STOWED FOR TAKE-OFF AND LANDING

Near each cabinet:

CABINET MUST BE CLOSED FOR TAKE-OFF AND LANDING

On the sliding door:

DOOR MUST BE OPEN AND LATCHED FOR TAKE-OFF AND LANDING

Close to each privacy curtain when installed:

CURTAIN MUST BE OPEN AND LATCHED FOR TAKE-OFF AND LANDING

In the lavatory:

**NO SMOKING WHEN
LAVATORY IN USE**

Close to each seat of the rear 2-place divan (Option # 6)
and
inside the toilet compartment (Option # 9)

NO SMOKING

In the coat closet of the cabin baggage compartment:

**CLOSET CAPACITY 90 LBS (40.8 KG)
COAT ROD 40 LBS (18.1 KG)
FLOOR 50 LBS (22.7 KG)**

On the forward cabinet drawers (if installed):

MAX. WT. CAPACITY
THIS AREA 24 LBS (10.9 KG)

MAX. WT. CAPACITY
THIS AREA 10 LBS (4.5 KG)

On each drawer of the refreshment cabinets as applicable (When optional refreshment cabinets are installed, suitable placards must be provided on each drawer stating the allowable maximum weight capacity):

MAX. WT. CAPACITY
THIS AREA XX LBS (YY KG)

On both rear pyramidal cabinets (if installed):

MAX. WT. CAPACITY
THIS AREA 10 LBS (4.5 KG)

In front of the rear baggage compartment door as applicable:

When no optional equipment is installed in the Baggage Compartment:

MAX LOAD : 400 lb / 181 kg

MAX SPEC. LOAD : 50 lb/ft^2 / 244 kg/m^2

When optional equipment is installed in the Baggage Compartment:

MAX LOAD : xxx lb / yyy kg

MAX SPEC. LOAD : 50 lb/ft^2 / 244 kg/m^2

Where xxx lb (yyy kg) is the maximum weight allowed for baggage load defined according to the National Aviation Authority.

Inside the toilet compartment close to the trash holder:

TRASH
NO CIGARETTE DISPOSAL

On the left of the baggage compartment door:

FILLING INSTRUCTION

1. **OPEN OVERFILLING VALVE ON L.G. BAY**
2. **REMOVE PLUG FROM FILLING PORT AND CONNECT HOSE FROM HAND PUMP VALVE**
3. **PUMP OIL MIL-H-5606 OR EQUIVALENT TO OVERFLOW FROM OVERFILLING**
4. **OIL CAPACITY FROM LOW LEVEL TO MAX LEVEL 200 CC**
5. **REMOVE HOSE AND PLUG FILLING PORT**
6. **CLOSE OVERFILLING VALVE**

In the hydraulic system filling area (in the baggage compartment):

EXTERNAL PRESSURIZATION

HYD. OIL FILLING PORT

Below the hydraulic system filling assembly (in the baggage compartment):

ECS OIL UNDER
BAGGAGE FLOOR

Near the ECS oil cap, below the baggage compartment floor:

ECS OIL
MIL-L-23699
TANK CAPACITY 53 CC.

1. **ECS DRAIN VALVE: OPEN**
2. **FILL TO OVERFLOW FROM ECS DRAIN VALVE**
3. **ECS DRAIN VALVE: CLOSE**

On the top right side of the fuselage, respectively over and below the refueling cap:

FUEL

JET A, JET A1, JET B PER ASTM D1655
PFA-55MB OR MIL-I-27686 ADDITIVE
MUST BE BLENDED
MIL-T-5624 GRADE JP4
MIL-T-83133 GRADE JP8

SEE AIRPLANE FLT. MANUAL FOR APPROVED FUELS QUANTITY OF ADDITIVE AND FUELING PROCEDURE

On the right side of the fuselage close to landing gear:

PRESSURE
REFUELING

On the back side of the pressure refueling door (right side of the fuselage):

MAXIMUM FUELING PRESSURE 60 PSIG
NO DEFUELING ALLOWED

FILLING PROCEDURE

1. **GROUND TEST SWITCH: "LAMP".**
   VERIFY LAMPS ILLUMINATION
2. **REFUEL SWITCH: OPEN**
   TK INTCON INT LAMP MOMENTARILY ON THEN
   TANK INTCON LAMP ON
3. **APPLY TANK TRUCK NOZZLE AND FILL**
4. **GROUND TEST SWITCH: "SYST"**
   VERIFY FUELING FLOW INTERRUPTION
5. **COMPLETE FUELING PROCEDURE**
6. **REFUEL SWITCH: CLOSED**
   TANK INTCON LAMP OFF THEN TK INTCON INT LAMP MOMENTARILY ON

SEE AIRPLANE FLT. MANUAL FOR APPROVED FUEL, QUANTITY OF ADDITIVE AND FUELING PROCEDURE

FUEL

JET A, JET A1, JET B PER ASTM D1655
PFA-55MB OR MIL-I-27686 ADDITIVE
MUST BE BLENDED

MIL-T-5624 GRADE JP4
MIL-T-83133 GRADE JP8

On left and right panels of forward wing, close to the flaps:

NO STEP

Above the emergency door handle (right side of fuselage):

OPEN

On the emergency door handle (right side of fuselage):

PUSH

Close to the passenger door handle (left side of fuselage):

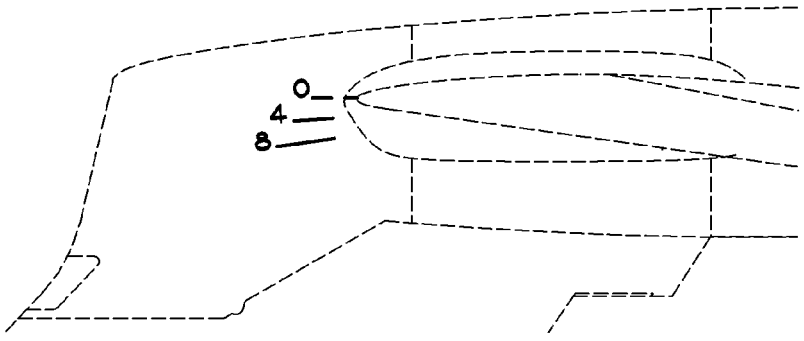
OPEN
CLOSE

On the back side of the GPU plug door (left side of the fuselage):

28 VDC
1200 A PEAK
FOR STARTING

400 A MAX CONT.
FOR SERVICE

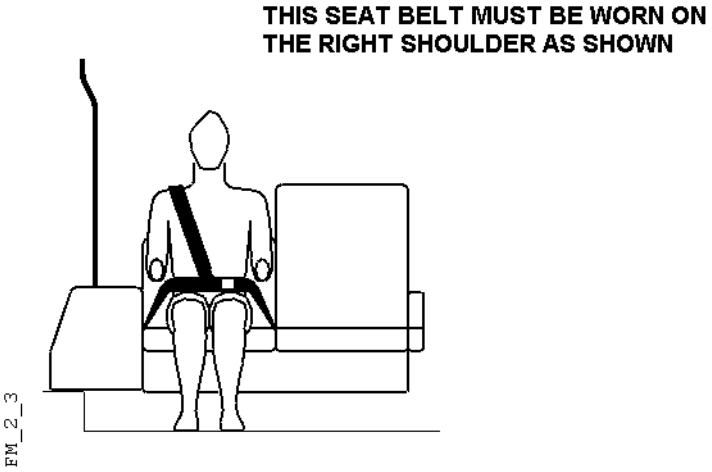
Horizontal stabilizer reference markings on top of left side of fin:



Close to each 14 Vdc Auxiliary Power Socket (if installed) in the cabin compartment:

14 VDC, 4 A MAX

On the right FWD partition, when the Option #1, or the Option #6, or the Option #19 two place side facing divan is installed on the FWD right side of the cabin:



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SECTION 3

EMERGENCY PROCEDURES

3.0 GENERAL

The recommended procedures for coping with various types of emergencies or critical situations are provided in this section. These procedures are suggested as a course of action for coping with the particular condition described, but are not a substitute for sound judgment and common sense.

3.1 AIRSPEEDS FOR EMERGENCY OPERATIONS

One Engine Air Minimum Control Speed (Propeller feathered) . . . . . 100 KIAS
One Engine Air Minimum Control Speed (Propeller Windmilling) . . . . . 128 KIAS
One Engine Best Rate of Climb Speed (Flaps UP, L/G UP) . . . . . 140 KIAS
One Engine Best Angle of Climb Speed (Flaps UP, L/G UP) . . . . . 132 KIAS

3.2 EMERGENCY PROCEDURES CHECK LIST

3.2.1 ENGINE FAILURES

ENGINE SECURING

1. Power lever - IDLE
2. Condition lever - CUT OFF
3. Ignition switch - CHECK NORM
4. Fuel firewall shut-off valve - CLOSED
5. Fuel pump switch - OFF
6. Autofeather - OFF
7. Generator - OFF
8. Bleed - OFF
9. Crossfeed - AS REQUIRED

ENGINE TORCHING

1. Condition lever (affected engine) - CUT OFF
2. Starter switch - KEEP to START position as necessary

CAUTION

Have maintenance personnel check engine and propeller.

ENGINE FAILURE DURING TAKEOFF BEFORE ROTATION

1. Directional control - MAINTAIN
2. Power levers - IDLE
3. Brakes - AS REQUIRED
4. Power levers - REVERSE as required
5. Stop straight ahead.

If insufficient runway remains for a safe stop:

6. Condition levers - CUT OFF
7. Generators - OFF
8. Fuel firewall shut-off valves - CLOSED
9. Battery switch (when the airplane has stopped) - OFF

WARNING

No attempt should be made to continue the takeoff if the engine failure occurs prior to becoming airborne.

ENGINE FAILURE DURING TAKEOFF AT OR AFTER ROTATION

If sufficient runway remains for a safe stop:

1. Directional control - MAINTAIN
2. Power levers - IDLE
3. Land straight ahead
4. Brakes - AS REQUIRED
5. Power levers - REVERSE as required

If insufficient runway remains or if the decision is made to continue the takeoff:

1. Directional control - MAINTAIN (Bank 5° max. towards operative engine when airborne)
2. Power levers - TAKEOFF
3. Landing gear (after climb established) - UP
4. Airspeed - ACCELERATE TO "ONE ENGINE 50 FEET HEIGHT SPEED" (Fig. 5-21)
5. Airspeed - INCREASE TO 125 KIAS MINIMUM
6. Flaps - UP (Speed per max. ramp 132 KIAS or max. rate of climb 140 KIAS as appropriate)
7. Obstacles - CLEAR
8. Inoperative engine - PERFORM ENGINE SECURING Procedure

NOTE

Airplanes <u>without</u> S.L. 80-0020.

If the left engine is shut down (power lever to IDLE) the landing gear aural warning is activated all the time with the landing gear UP and the flap to MID.

* * * * * *

Airplanes incorporating S.L. 80-0020.

The landing gear aural warning is activated if the flaps are not retracted within approximately 25 seconds after the landing gear has been retracted.

* * * * * *

9. Taxi/Landing lights (if applicable) - OFF
10. Airspeed - INCREASE as required
11. Land at nearest suitable airport, performing the SINGLE ENGINE APPROACH AND LANDING Procedure

WARNING

The decision to continue a takeoff, single engine is primarily predicated upon, but not necessarily limited to, the aircraft's ability to climb on a single engine with the gear extended and flaps in the takeoff position. Prior to flight, review airfield requirements and determine that adequate single engine climb performance exists, considering aircraft weight, ambient conditions, and pilot proficiency, to safely complete the takeoff should an engine fail at or after rotation.

ENGINE FAILURE IN FLIGHT BELOW V_{MCA}

1. Power lever (operative engine) - REDUCE power to maintain control
2. Airspeed - INCREASE above V_{MCA}
3. Power lever (operative engine) - AS REQUIRED
4. Inoperative engine - SECURE as per ENGINE SECURING Procedure

ENGINE FIRE (GROUND) (L OR R FIRE LIGHT ON)

Affected Engine:

1. Condition lever - CUT OFF
2. Ignition switch - CHECK NORM
3. Fuel firewall shut-off valve - CLOSED
4. Fuel pump switch - OFF
5. Fire extinguisher button - PUSH (if installed)
6. Radio - CALL FOR ASSISTANCE
7. AIRPLANE EVACUATION Procedure - PERFORM (when the airplane has stopped)
8. External Fire Extinguisher - USE

NOTE

If engine fire has spread to the ground, it may be possible to taxi clear of fire zone.
If fire continues, shut down both engines and evacuate.

ENGINE FAILURE OR FIRE IN FLIGHT (L OR R FIRE LIGHT ON)

1. Directional control - MAINTAIN (Bank 5° max. towards operative engine)

Affected Engine:

2. Power lever - IDLE
3. Condition lever - CUT OFF
4. Ignition switch - CHECK NORM
5. Firewall shut-off valve - CLOSED
6. Fuel pump switch - OFF
7. Autofeather - OFF
8. Generator - OFF
9. Bleed air - OFF
10. Fire extinguisher button (if ENG FIRE light illuminates) - PUSH (if installed)
11. Electrical load - MONITOR
12. Fuel crossfeed - CONSIDER
13. Land as soon as practical, performing the SINGLE ENGINE APPROACH AND LANDING Procedure

NOTE

The engine fire extinguisher is a single shot system with one cylinder for each engine.

CAUTION

When conducting a practice run through these procedures, do not close fuel firewall shut-off valves and do not actuate engine fire extinguishers.
Fire extinguisher capability has not been evaluated by Airworthiness Authority.

NOTE

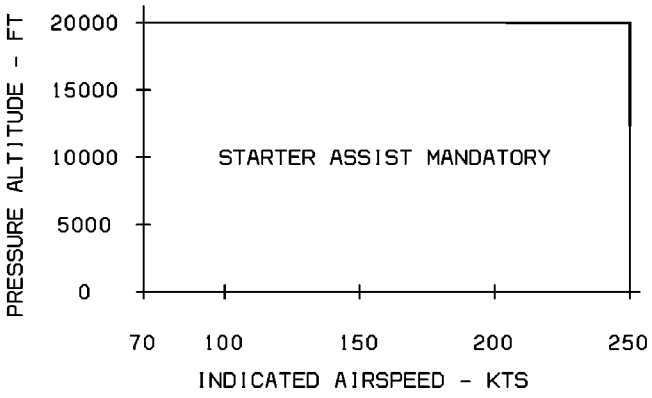
Operation in icing conditions above 14000 ft. is limited to 5 minutes, due to a possible lack of efficiency of the engine inlet de-ice boot system.

3.2.2 AIR START

CAUTION

The pilot should determine the reason for engine failure before attempting an air start. Do not attempt a relight if the N_G tachometer indicates zero percent.

RECOMMENDED AIR START ENVELOPE
PROPELLER FEATHERED



Minimum N_G for airstart 13%

NOTE

Air start may be attempted outside of the envelope, or lower N_G provided ITT starting limit is monitored and not exceeded.

NORMAL AIR START

1. Fuel firewall shut-off valve (inoperative engine) - OPEN
2. Fuel pump switch (inoperative engine) - MAIN (FUEL PRESS light - OFF)
3. Engine start switch - START
4. Condition lever - GROUND IDLE (at 13% N_G)
5. Engine oil press - CHECK
6. ITT and N_G - CHECK
7. Engine start switch - CHECK OFF
8. Condition lever - AS REQUIRED
9. Power lever - AS REQUIRED
10. Generator - ON
11. Bleed air - ON

NOTE

In case of an unsuccessful start, pull the condition lever to CUT OFF and power lever to IDLE.
Slow down the airplane to 140 KIAS and after approximately one minute, repeat the NORMAL AIR START Procedure, using manual ignition (IGN) switch, which must be set to NORM after N_G reaches 54%.

AIR START WITHOUT STARTER ASSIST

1. Fuel firewall shut-off valve (inoperative engine) - OPEN
2. Fuel pump switch (inoperative engine) - MAIN (FUEL PRESS light - OFF)
3. N_G (inoperative engine) - 13% MIN.
4. Ignition switch (inoperative engine) - IGN
5. Condition lever (inoperative engine) - GROUND IDLE
6. ITT, Oil Pressure - MONITOR
7. Ignition switch - NORM (N_G min 54%)
8. Condition lever - AS REQUIRED
9. Power lever - AS REQUIRED
10. Generator - ON
11. Bleed air - ON

3.2.3 SMOKE IN COCKPIT

1. Cockpit curtain (if installed) - KEEP OPEN
2. Crew and passenger oxygen - MANUAL MASK RELEASE/DON MASK
3. Oxygen mask microphone - MASK
4. Crew air outlet - OPEN
5. Cockpit blower switch - CKPT BLOWER
6. Source of smoke - IDENTIFY AND ELIMINATE as per the following ELECTRICAL FIRE OR SMOKE Procedure or ENVIRONMENTAL SYSTEM SMOKE Procedure

CAUTION

If it cannot be readily confirmed if the source of the smoke or fire has been eliminated, then land as soon as practical.

ELECTRICAL FIRE OR SMOKE

1. Flashlight (at night) - LOCATE
2. Cabin press. selector - MAN

   Perform CABIN PRESS AUTO MODE FAILURE Procedure
3. Bus disconnect switch - BUS DISC

   Perform the following, pausing momentarily after each step to isolate faulty circuits:

   a. L/R generator (one at a time) - OFF

   If smoke persists:

   b. Left and Right Generator - ON

CAUTION

In case of FUEL PUMP light ON, before performing the following steps, descend to altitudes below 25000 ft with JET A-1 fuel and below 14000 ft with JP4 fuel.

   c. L/R ESNTL BUS circuit breakers (red colored) - PULL
   d. Battery switch - OFF

WARNING

With battery OFF, the loads of essential bus will be inoperative.

If fire persists extinguish with portable fire extinguisher, if available.

4. Land as soon as practical.

ENVIRONMENTAL SYSTEM SMOKE

1. Left bleed air switch - OFF
2. Left bleed air switch - ON
3. Right bleed air switch - OFF

If smoke persists:

4. Left bleed air switch - OFF
5. Bleed air emergency switch - EMER
6. EMERGENCY DESCENT Procedure - PERFORM
7. Cabin press selector - MAN
8. Manual controller switch - UP
9. Rate control knob - AS REQUIRED
10. Dump switch (at 12000 ft) - DUMP
11. Bleed air emergency switch - OFF
12. Land as soon as practical

3.2.4 EMERGENCY DESCENT

1. Power levers - IDLE
2. Condition levers - MAX RPM
3. Seat belts and no smoking signs - ON
4. Airplane attitude - NOSE DOWN in order to reach V_{MO}/M_{MO} as soon as possible

3.2.5 MAXIMUM GLIDE

1. Airspeed - per Maximum Glide Speed Chart (see below)
2. Gear - UP
3. Flaps - UP
4. Condition levers - CUT OFF

Maximum Glide Speed Chart

Weight - lbs	Speed - KIAS
11550	155
11000	151
10000	144
9000	137
8000	129

Glide Ratio (Refer also to BEST GLIDE DISTANCE graph in Section 5 "Performance") . . . . . 2.3 NM/1000 ft

NOTE

When operating in sustained icing condition, the Glide Ratio may be reduced up to 50% approximately.

3.2.6 LANDING EMERGENCIES

LANDING WITHOUT ENGINE POWER

CAUTION

With both generators inoperative only essential, battery and hot battery busses are fed, for approximately 30 minutes depending on loads and battery charge.

1. Airplane configured - Per MAXIMUM GLIDE Procedure (if altitude permits)

When landing site assured:

2. Approach Speed - INCREASE the flaps DN approach speed (Fig. 5-72) by 20 KIAS
3. Condition levers - CUT OFF
4. Fuel firewall shut-off valves - CLOSED
5. Fuel pumps switches - OFF

If gear is to be extended:

NOTE

For particular terrain conditions it may be required to land with gear up.

6. Gear - DN (PER EMERGENCY GEAR EXTENSION Procedure)

NOTE

Gear extension requires approximately 60 handpump strokes: this procedure requires normally 90 sec.

7. Emergency gear selector - PUSH
8. Hydraulic pump switch - HYD
9. Landing distance - INCREASE the flaps DN landing distance (Fig. 5-72) by approximately 125%

NOTE

When operating in sustained icing condition, assume the same procedure except approach speed which, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 15 KIAS.
The landing distance, as compared with the flaps MID landing distance (Fig. 5-76), must be increased approximately by 90%.

SINGLE ENGINE APPROACH AND LANDING

WARNING

Do not exceed maximum fuel imbalance (200 lbs).

1. Inoperative engine - COMPLETE ENGINE SECURING Procedure
2. Condition lever (operating engine) - MAX RPM
3. Flaps - MID

NOTE

Airplanes without S.L. 80-0020.

If the left engine is shut down (power lever to IDLE) the landing gear aural warning is activated all the time with the landing gear UP and the flap to MID.

* * * * * *

Airplanes incorporating S.L. 80-0020.

The landing gear aural warning is activated all the time with the landing gear UP and the flaps to MID.

* * * * * *

4. Airspeed - 129 KIAS MIN.
5. Landing gear (when landing assured) - DN

When it is certain there is no possibility of go-around:

6. Flaps - DN
7. Approach speed - AS PER Fig. 5-72
8. Power lever - AS REQUIRED

After touchdown:

9. Brakes and reverse - AS REQUIRED
10. Landing distance - INCREASE the flaps DN landing distance (Fig. 5-72) approximately:
    30% if reverse thrust is not applied, or
    25% if reverse thrust is applied

NOTE

When operating in sustained icing condition assume the same procedure except: flap position must be MID, and approach speed, as compared with the flaps MID approach speed (Fig 5-76), must be increased by 6 KIAS.
The flaps MID landing distance (Fig. 5-76) must be increased approximately by 30% if reverse thrust is not applied and by 25% if reverse thrust is applied.

SINGLE ENGINE GO-AROUND

1. Power - TAKE OFF
2. Airspeed - Minimum 120 KIAS
3. Flaps - MID
4. Landing gear - UP
5. Airspeed - INCREASE TO 125 KIAS MINIMUM
6. Flaps - UP

NOTE

Airplanes without S.L. 80-0020.

If the left engine is shut down (power lever to IDLE) the landing gear aural warning is activated all the time with the landing gear UP and the flap to MID.

* * * * * *

Airplanes incorporating S.L. 80-0020.

The landing gear aural warning is activated if the flaps are not retracted within approximately 25 seconds after the landing gear has been retracted.

* * * * * *

7. Taxi/Landing lights (if applicable) - OFF
8. Airspeed - INCREASE as required

WARNING

When operating in sustained icing conditions, insufficient performance may exist to successfully carry out a single engine go-around.

LANDING WITH PRIMARY LONGITUDINAL CONTROL FAILED

When ready for approach:

1. Trim - IN LEVEL FLIGHT TO 134 KIAS
2. Runway - Select longest in area suitable for a low angle descent
3. Landing gear - DN
4. Flaps - MID
5. Trim - TO 130 KIAS
6. Power - AS REQUIRED
7. Condition levers - MAX RPM
8. Flaps - DN
9. Trim - TO 121 KIAS

NOTE

When operating in sustained icing condition assume the same procedure except: flap position must be MID, and approach speed, as compared with the flaps MID approach speed (Fig 5-76), must be increased by 6 KIAS.

When positioned over the runway, flare airplane with longitudinal trim and slowly reduce power:

10. Brakes (after nose wheel touchdown) - AS REQUIRED
11. Reverse - AS REQUIRED

LANDING WITH STABILIZER JAMMED

1. Condition levers - MAX RPM
2. Power levers - AS REQUIRED
3. Landing gear - DN

Stabilizer jammed in nose down trim position:

4. Flaps - MID
5. Approach Speed - INCREASE the flaps DN approach speed (Fig. 5-72) by 15 KIAS
6. Brakes and reverse - AS REQUIRED
7. Landing distance - INCREASE the flaps DN landing distance (Fig. 5-72) by approximately 45%

Stabilizer jammed in nose up trim position:

8. Flaps - DN
9. Approach speed - AS PER Fig. 5-72
10. Brakes and reverse - AS REQUIRED

NOTE

When operating in sustained icing conditions assume the same procedure except: flap position must be MID, whatever is the stabilizer position, and the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 10 KIAS.
The flaps MID landing distance (Fig. 5-76) must be increased approximately by 25%.

LANDING WITH LONGITUDINAL CONTROL SPRING FAILED

1. Condition levers - MAX RPM
2. Power levers - AS REQUIRED
3. Landing gear - DN
4. Flap - MID
5. Approach Speed - INCREASE the flaps DN approach speed (Fig. 5-72) by 15 KIAS
6. Brakes and reverse - AS REQUIRED
7. Landing distance - INCREASE the flaps DN landing distance (Fig. 5-72) by approximately 40% if the reverse thrust is not applied

NOTE

When operating in sustained icing condition, assume the same procedure except approach speed which, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 10 KIAS.
The flaps MID landing distance (Fig. 5-76) must be increased approximately by 20%.

LANDING WITH AUTOFEATHER SYSTEM INOPERATIVE (AMBER AUTOFEATHER LIGHT ON)

1. Condition lever - MAX RPM
2. Power levers - AS REQUIRED
3. Landing gear - DN
4. Flap - MID
5. Approach Speed - INCREASE the flaps DN approach speed (Fig. 5-72) by 15 KIAS
6. Brakes and reverse - AS REQUIRED
7. Landing distance - INCREASE the flaps DN landing distance (Fig. 5-72) by approximately:
   35% if reverse thrust is not applied, or
   26% if reverse thrust is applied

NOTE

When operating in sustained icing condition, assume the same procedure except approach speed which, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 6 KIAS.
The flaps MID landing distance (Fig. 5-76) must be increased approximately by 10% if reverse thrust is not applied or by 5% if reverse thrust is applied.

GEAR UP LANDING

When normal and emergency gear extension procedures have failed:

1. Select a suitable landing area
2. Ground personnel - INFORM
3. Passengers - BRIEF on use of emergency exit; CHECK properly fastened with seat belts
4. Fuel - BURN OFF EXCESS, if condition permits
5. AURAL WARN circuit breaker - PULL
6. Emergency gear selector - PUSH
7. Hydraulic pump switch - HYD
8. Gear selector - UP
9. Flaps - DN
10. Make a normal approach.

When landing is assured:

11. Cabin Pressurization - DUMP
12. Generators - OFF
13. Condition levers - CUT OFF
14. Fuel pumps - OFF
15. Fuel firewall shut-off valves - CLOSED
16. Battery switch - OFF
17. Evacuate as per AIRPLANE EVACUATION Procedure when the airplane comes to a stop.

NOTE

When operating in sustained icing condition assume the same procedure except: flap position must be MID, and approach speed, as compared with the flaps MID approach speed (Fig 5-76), must be increased by 6 KIAS.

NOSE GEAR UP OR UNLOCKED LANDING

1. Final approach according with normal procedure
2. Touch down in nose up attitude
3. Mantain nose up to the lowest practicable speed
4. After the nose touch down use maximum brake and reverse
5. Evacuate as per AIRPLANE EVACUATION Procedure when the airplane comes to a stop.

NOTE

When operating in sustained icing condition assume the same procedure except: flap position must be MID, and approach speed, as compared with the flaps MID approach speed (Fig 5-76), must be increased by 6 KIAS.

MAIN GEAR UNLOCKED LANDING

When normal and emergency gear extension procedures have failed:

1. Emergency gear selector - PUSH
2. Hydraulic pump switch - HYD

If both main landing gear legs are extended:

1. Final approach according with normal procedure
2. Touch down in nose up attitude
3. After touch down apply reverse and brakes cautiously
4. Evacuate as per AIRPLANE EVACUATION Procedure when the airplane comes to a stop.

If one main landing gear leg remains retracted:

1. Perform GEAR UP LANDING Procedure

NOTE

When operating in sustained icing condition assume the same procedure except: flap position must be MID, and approach speed, as compared with the flaps MID approach speed (Fig 5-76), must be increased by 6 KIAS.

ASYMMETRIC FLAP LANDING (FLAP SYNC LIGHT ON)

1. FLAP SYSTEM MALFUNCTION Procedure - COMPLETE
2. Condition levers - MAX RPM
3. Power levers - AS REQUIRED
4. Landing gear - DN
5. Approach speed - INCREASE the flaps DN approach speed (Fig. 5-72) as indicated in the table below
6. Brakes and reverse - AS REQUIRED
7. Landing distance - if the reverse thrust is not applied INCREASE the flaps DN landing distance (Fig. 5-72) approximately as indicated in the table below

Outboard Flap Position	Speed Increase	Landing Distance Increase
DN	5 KIAS	10%
MID	15 KIAS	40%
UP	20 KIAS	65%

NOTE

When operating in sustained icing conditions assume the same procedure except approach speed which, as compared with the flaps MID approach speed (Fig 5-76), must be increased as indicated in the table below:

Outboard Flap Position	Speed Increase	Landing Distance Increase (Fig. 5-76)
MID	10 KIAS	20%
UP	15 KIAS	40%

LANDING WITH FLAPS RETRACTED

1. Approach Speed - INCREASE the flaps DN approach speed (Fig. 5-72) by 20 KIAS
2. Condition levers - MAX RPM
3. Power levers - AS REQUIRED
4. Landing gear - DN

After touchdown

5. Reverse - AS REQUIRED
6. Landing distance - INCREASE the flaps DN landing distance (Fig. 5-72) by approximately:
   65% if reverse thrust is not applied, or
   55% if reverse thrust is applied

NOTE

When operating in sustained icing conditions assume the same procedure except approach speed which, as compared with the flaps MID approach speed (Fig 5-76), must be increased by 15 KIAS.
The landing distance, as compared with the flaps MID landing distance (Fig. 5-76), must be increased approximately by 40% if reverse thrust is not applied or by 30% if reverse thrust is applied.

3.2.7 SYSTEM EMERGENCIES

ENGINE SYSTEM FAILURE

LOW OIL PRESSURE

Between 60 and 90 PSI (yellow arc):

1. Power - REDUCE below 1100 LB-FT torque

Below 60 PSI and L or R OIL PRESS red light on

1. ENGINE SECURING Procedure - PERFORM
2. Land as soon as practical, performing the SINGLE ENGINE APPROACH AND LANDING Procedure

HIGH OIL PRESSURE

Between 135 PSI and 150 PSI

1. Power - REDUCE
2. Land as soon as practical.

Above 150 PSI

1. ENGINE SECURING Procedure - PERFORM
2. Land as soon as practical, performing the SINGLE ENGINE APPROACH AND LANDING Procedure

HIGH OIL TEMPERATURE (MORE THAN 104° C)

1. OIL COOL switch - CHECK L and R position (on the ground only)
2. Airspeed - INCREASE as required
3. Power - REDUCE as required

If the temperature exceeds the limit (110°C):

4. ENGINE SECURING Procedure - PERFORM
5. Land as soon as practical, performing the SINGLE ENGINE APPROACH AND LANDING Procedure

PROPELLER SYSTEM FAILURE

OVERSPEEDING PROPELLER

If prop exceeds 2020 RPM steady state remaining below 2200 RPM

1. Condition lever - REDUCE RPM
2. Power lever - REDUCE as practical
3. Airspeed - REDUCE TO LOWEST PRACTICAL

If prop exceeds 2205 RPM:

1. Power lever - IDLE
2. Condition lever - CUT OFF
3. ENGINE SECURING Procedure - COMPLETE
4. Land as soon as practical, performing the SINGLE ENGINE APPROACH AND LANDING Procedure.

FUEL SYSTEM FAILURE

FUEL PUMP FAILURE (L OR R FUEL PUMP LIGHT ON)

1. FUEL PRESS light - CHECK
2. Fuel pump switch - CHECK MAIN
3. Main pump circuit breaker - CHECK PUSHED

If FUEL PRESS light is not illuminated, the Main fuel pump has failed but the Stand-by fuel pump is working properly.

4. Fuel pump switch - STAND BY

LOW FUEL PRESS (L OR R FUEL PRESS LIGHT ON)

1. Fuel pump switch - CHECK MAIN
2. Main pump circuit breaker - CHECK IN
3. Fuel pump switch - STAND BY
4. Power (affected engine) - REDUCE as practical
5. Fuel quantity gauges - COMPARE rate of change with other side

If rate of change is equal:

6. Continue the flight

If rate of change is higher (on the affected side):

7. ENGINE SECURING Procedure - PERFORM
8. Land as soon as practical, performing the SINGLE ENGINE APPROACH AND LANDING Procedure

FUEL FILTER OBSTRUCTED (L OR R FUEL FILTER LIGHT ON)

1. FUEL PRESS light - CHECK

If not illuminated:

2. CONTINUE the flight and have a maintenance check

If illuminated:

3. Power (affected engine) - REDUCE as practical
4. Land as soon as practical

FUEL FIREWALL SHUTOFF VALVE FAILED IN TRANSIT (L OR R F/W V INTRAN LIGHT ON)

On the ground have a maintenance check. Takeoff is not authorized.
If failure occurs during flight, land as soon as practical.

WING FUEL BALANCING PROCEDURE

NOTE

1. The following procedure can be performed only before takeoff or during cruise.
2. At high fuel flow rate, the L/R FUEL PRESS amber light may illuminate.

1. CROSSFEED knob - TURN HORIZONTAL
2. Fuel pump (low fuel level side) - OFF
3. Fuel quantity - MONITOR

FUEL CROSSFEED FAILED IN TRANSIT (X FEED INTRAN LIGHT ON)

1. Fuel quantity - MONITOR

On the ground have a maintenance check. Takeoff is not authorized.
If failure occurs during flight, land as soon as practical.

ELECTRICAL SYSTEM FAILURE

SINGLE GENERATOR FAILURE (GEN LIGHT ON)

1. Generator switch - RESET then L or R position

If the generator does not reset:

2. Generator switch - OFF
3. Operating Generator - DO NOT EXCEED 400 Amps LOAD

NOTE

With only one generator operating all busses are fed.

ELECTRICAL OVERLOAD (WARN LEGEND FLASHING ON MULTIFUNCTION DISPLAY)

1. Multifunction display - MONITOR
2. Electrical load - REDUCE

DUAL GENERATOR FAILURE (L GEN, R GEN AND BUS DISC LIGHTS ON)

CAUTION

With both generators inoperative only essential, battery and hot battery busses are fed, for approximately 30 minutes depending on loads and battery charge.

1. Both Generator Switches - RESET then L or R position

If the generators do not reset:

2. Generators switches - OFF
3. Bus Connecting Switch - EMER if necessary

NOTE

With bus connecting switch in EMER position, L/R DUAL FEED BUSSES are powered: limit this operation to prevent further reduction of battery life time.

4. Land as soon as practical (normal gear extension and flap operation are not possible), extending the gear as per EMERGENCY GEAR EXTENSION Procedure and performing both the LANDING WITH FLAPS RETRACTED and the CABIN PRESS AUTO MODE FAILURE Procedures.

ANY CIRCUIT BREAKER TRIPPED

1. Circuit breaker - PUSH TO RESET
2. If Circuit Breaker trips again - DO NOT RESET

CAUTION

Circuit Breakers should not be reset more than once until the cause of circuit malfunction has been determined and corrected.

BATTERY OVERTEMPERATURE CONDITION (BAT TEMP LIGHT ON) (BAT OVHT LIGHT ON)

On the Ground

1. Multifunction display - SELECT AND MONITOR BATTERY TEMPERATURE

With BAT TEMP light illuminated (at or above 120°F)
2. DO NOT TAKE OFF IF TEMPERATURE TREND IS INCREASING

With BAT OVHT light illuminated (at or above 150°F)
3. Battery switch - OFF
4. DO NOT TAKE OFF

During Flight

If BAT TEMP light is illuminated (120°F)
1. Battery temperature - MONITOR

If BAT OVHT light is illuminated (150°F):
2. Battery switch - OFF
3. Land as soon as possible at nearest suitable airport

CAUTION

If Battery Temperature reached 150°F, either during start or in flight, battery must be removed for bench test and inspection prior to the next flight.

PRIMARY INVERTER FAILURE (PRI INV LIGHT ON)

1. Avionics - CHECK for disabled equipment

NOTE

In the event of primary inverter failure the primary inverter bus automatically connects to the secondary inverter while the secondary inverter bus disengages and related loads are lost.

SECONDARY INVERTER FAILURE (SEC INV LIGHT ON)

1. Secondary inverter switch - OFF then SEC

If power is not restored:
2. Avionics - CHECK for disabled equipment

AUDIO CONTROL PANEL FAILURE

1. EMG red button - PUSH

NOTE

When in emergency mode, the audio control panel allows normal use of transmit and receive functions, with or without power to the system. Page and interfone functions are lost, while mask/boom microphone can be utilized.

HYDRAULIC SYSTEM FAILURE (HYD PRESS LIGHT ON)

CAUTION

With the hydraulic pressure at 3000 PSI it is possible to operate the system but hydraulic pump motor must operate for not more than 1 minute.
Do not operate the parking brake with the hydraulic pressure above 1200 PSI.
With the hydraulic pressure above normal value the steering will be more sensitive.
With the hydraulic pump off the steering is inoperative and the brakes are less effective.

If landing gear is down:

1. Hyd pump switch - CHECK HYD
2. HYDR PRESS WRN and HYDR CONT circuit breakers - CHECK IN
3. Hyd pressure - CHECK

If out of range (700 ÷ 1300 PSI) then:

4. Hyd pump switch - OFF

If landing gear is up:

1. Hyd pump switch - OFF

Immediately before landing gear extension:

2. Hyd pump switch - HYD

EMERGENCY GEAR EXTENSION

1. Gear selector - DN
2. Hyd pump switch - OFF
3. Emergency selector - PULL
4. Hand pump - OPERATE (until the 3 green lights illuminate) (about 60 strokes)

EMERGENCY BRAKE OPERATION

Pedal brake operation becomes harder than normal (about 50% increase).

1. Brakes - APPLY
2. Reverse thrust - AS REQUIRED

Normal ground roll (Fig. 5-72) will increase approximately by 55% if reverse thrust is not applied.

NOTE

When operating in icing condition the ground roll with flaps MID (Fig. 5-76) will increase approximately by 80% if reverse thrust is not applied.

STEERING SYSTEM FAILURE (STEER FAIL LIGHT ON)

1. Control Wheel Master Switch - PRESS
2. Directional control - MAINTAIN (as necessary) with differential braking
3. Steering lights - CHECK OFF

NOSE WHEEL STEER RUNAWAY

If an uncontrolled heading change occurs:

1. Control Wheel Master Switch - PRESS
2. Directional control - MAINTAIN with differential braking and asymmetrical power

LONGITUDINAL CONTROL SYSTEM MALFUNCTION

LONGITUDINAL TRIM RUNAWAY

1. Control Wheel Master Switch - PRESS
2. Longitudinal trim switch - SEC

CAUTION

Trim in motion aural warning will not be operative when in secondary mode.

PRIMARY LONGITUDINAL TRIM FAILURE

1. PRI PITCH TRIM breaker - CHECK IN
2. Longitudinal trim switch - SEC

CAUTION

Trim in motion aural warning will not be operative when in secondary mode.

LONGITUDINAL CONTROL SPRING FAILURE

1. Speed - REDUCE to 210 KIAS (if flying at high speed and altitude above 30,000 feet with aft C.G.)
2. Land performing the LANDING WITH LONGITUDINAL CONTROL SPRING FAILED Procedure.

FLAP SYSTEM MALFUNCTIONS

FLAP SYNCRO FAILURE (FLAP SYNC LIGHT ON)

NOTE

During flap deployment or retraction, any significant asymmetric condition results in abnormal control forces which could be detected by the pilot earlier than the FLAP SYNC light becomes illuminated.

1. Maintain control using primary and secondary flight control systems
2. Flap selector lever and flap position indicator - CHECK POSITION

If any flap is not in the correct position (asymmetry):

3. Analyse the malfunction on the flap position indicator and, if necessary, reconfigure the remaining flap systems to minimize the asymmetry.
4. Land performing ASYMMETRIC FLAP LANDING Procedure

If all flaps are in the correct position:

5. Do not move the flap selector lever and land assuming ASYMMETRIC FLAP LANDING Procedure from step 2.

PRESSURIZATION AND ENVIRONMENTAL SYSTEM MALFUNCTION

RAPID OR EXPLOSIVE DECOMPRESSION (CAB PRESS LIGHT ON)

1. Crew and passenger oxygen - MANUAL MASK RELEASE/DON MASKS
2. Oxygen mask microphone - MASK
3. Emergency bleed air switch - EMER
4. EMERGENCY DESCENT Procedure - PERFORM down to 12000 ft.
5. Emergency bleed air switch - OFF

CABIN ALTITUDE ABOVE 9,500 FEET (CAB PRESS LIGHT ON)

1. Crew and passenger oxygen - MANUAL MASK RELEASE/DON MASK
2. Oxygen mask microphone - MASK
3. Bleed air switches - VERIFY L and R position
4. Cab sel/Auto sched switch - MAN
5. Manual controller switch - DN
6. Rate control knob - AS DESIRED

If cabin altitude continues to increase:

7. Emergency bleed air switch - EMER
8. EMERGENCY DESCENT Procedure - PERFORM IF REQUIRED down to 12000 ft.
9. Emergency bleed air switch - OFF

CABIN DIFFERENTIAL PRESSURE ABOVE 9.4 PSID (CAB PRESS LIGHT ON)

1. Bleed air switches - OFF
2. Crew oxygen - AUTO NORMAL/DON MASK

When differential pressure reaches 8 psid

3. Bleed air switches - L and R position
4. CABIN PRESS AUTO MODE FAILURE - PERFORM

If the cabin pressure differential cannot be controlled:

5. CABIN DEPRESSURIZATION (DUMP) Procedure - PERFORM if necessary
6. EMERGENCY DESCENT Procedure - PERFORM

CABIN PRESS AUTO MODE FAILURE

1. Cabin press switch - MAN
2. Manual controller - AS REQUIRED
3. Rate control knob - AS REQUIRED
4. Cabin altitude / Δp - CHECK
5. Cabin rate - CHECK
6. Below 10000 ft and Before Landing:
   – Rate control knob - SET to MAX RATE (if possible)
   – Manual control lever - UP
7. Cabin altitude / Δp - CHECK Landing Field / Zero

CAUTION

The Airplane is not approved for landing when pressurized.

8. After touchdown and before opening the door: dump switch - DUMP

DOOR SEAL FAILURE (DOOR SEAL LIGHT ON)

1. Flying altitude - DESCEND or limit altitude to 30000 ft or below
2. Cabin altitude/Δp - CHECK
3. Cabin rate - CHECK

If cabin pressure variation is rapid:

4. EMERGENCY DESCENT - CONSIDER
5. Crew and passenger oxygen - AS REQUIRED

CABIN DEPRESSURIZATION (DUMP) PROCEDURE

1. Crew and passenger oxygen - MANUAL MASK RELEASE
2. Masks - DON if necessary
3. Dump switch - DUMP

BLEED AIR OVERTEMPERATURE (L/R BLEED TEMP LIGHT ON)

1. Affected engine - REDUCE N_G

If light persists illuminated

2. Affected side bleed air switch - OFF

ENVIRONMENTAL AUTO CONTROL FAILURE (OR DUCT TEMP LIGHT ON)

AIRPLANES EQUIPPED WITH AIR CYCLE MACHINE

1. AUTO/MAN switch - MAN
2. MAN HEAT/COOL switch - COOL

NOTE

The temperature modulating valve requires about 15 seconds operating time from full hot to full cold.

If the DUCT TEMP light is ON and persists for further 15 seconds then:

3. Bleed air switches - OFF
4. Emergency bleed air switch - EMER
5. Flying altitude - REDUCE down to 9500 ft
6. Emergency bleed air switch - OFF

AIRPLANES EQUIPPED WITH HEATING UNIT (Mod. 80-0288)

1. AUTO/OFF/MAN switches - MAN
2. Manual HI/LO switches - LO

NOTE

The temperature modulating valves require about 15 seconds operating time from full hot to full cold.

If the DUCT TEMP light is ON and persists for further 15 seconds then:

3. Bleed air switches - OFF
4. Emergency bleed air switch - EMER
5. Flying altitude - REDUCE down to 9500 ft
6. Emergency bleed air switch - OFF

ICE PROTECTION SYSTEMS FAILURE

ICE DETECTOR FAILURE (ICE LIGHT OFF OR ALWAYS ON)

1. ENG ICE VANE/OIL COOLER INTK switches - CHECK to L and R position
2. Determine ice forming condition by visual inspection

Heavy ice conditions:

3. BOOTS DE ICE switch - TIMER

Light ice conditions:

4. BOOTS DE ICE switch - CYCLE TIMER/OFF (every 6 minutes approximately)

CAUTION

Continous cycling of boots during some types of ice encounters may result in failure to remove ice.

ENGINE AIR INTAKE BOOTS (LE OR RE BOOTS DE ICE LIGHT OFF OR ALWAYS ON)

1. ENG ICE VANE/OIL COOLER INTK switches - CHECK to L and R position

If the system is operating in AUTO mode:

2. Determine ice accretion by visual inspection

Heavy ice conditions:

3. BOOTS DE ICE switch - TIMER

Light ice conditions:

4. BOOTS DE ICE switch - CYCLE TIMER/OFF (every 6 minutes approximately)

CAUTION

Continous cycling of boots during some types of ice encounters may result in failure to remove ice.

If light persists off (or on):

5. Leave ice condition as soon as possible

ENGINE INERTIAL SEPARATOR AND OIL COOLER AIR INLET (L OR R ENG/OIL A/I LIGHT OFF)

1. Torque drop of the affected engine - CHECK (at least 20 seconds after actuation)

If the torque drop is not similar to the other engine, an engine inertial separator failure is suspected:

2. ENG ICE VANE/OIL COOLER INTK switch - SET to OFF then to L or R position

If the normal operating condition is not restored:

3. Leave ice condition as soon as possible

If the torque drop is similar to the other engine:

4. Power levers - INCREASE POWER MOMENTARILY

If the light persists off, an oil cooler air inlet heater failure is suspected:

5. Oil temperature (affected side) - CHECK

If the oil temperature increases abnormally:

6. Leave ice condition as soon as possible.

MAIN WING OVERHEAT (L OR R MN WG OVHT LIGHT ON)

1. Affected side main wing anti-ice switch - OFF

If light (after 20 seconds) persists ON

2. Power levers - REDUCE POWER as practical
3. Leave ice condition as soon as practical

If light extinguishes:

4. Affected side main wing anti-ice switch - MANUAL and check the MN WG OVHT light.

CAUTION

In light ice conditions, in order to avoid overheat, a N_G between 88% and 91% is recommended. Should the red MN WG OVHT light illuminate, the affected system must be turned OFF for one minute approximately.

MAIN WING A/ICE FAILURE

L or R MN WG A/ICE light OFF

1. Power lever - INCREASE POWER MOMENTARILY

If the light remains off:

2. L or R MAIN WING switches - OFF (for approx. 10 seconds) then MANUAL checking the ITT variation

If the light, after approx. 30 seconds, is still off and ITT has not increased by 20°C approx.:

3. Main and forward wings anti-ice systems - SWITCH OFF
4. Leave ice condition as soon as possible

If the light illuminates, or remains off but the ITT has increased by 20°C approx.:

5. L or R MAIN WING switches - MANUAL and check the MN WG OVHT light

CAUTION

In light ice conditions, in order to avoid overheat, a N_G between 88% and 91% is recommended. Should the red MN WG OVHT light illuminate, the affected system must be turned OFF for one minute approximately.

L or R MN WG A/Ice light flashing

The system is operating:

1. Do not select MANUAL mode

FORWARD WING OVERHEAT (L OR R FD WG OVHT LIGHT ON)

1. Affected side FWD WING switch - SET to OFF position
2. Leave ice condition as soon as practical

FORWARD WING A/ICE FAILURE (L OR R FD WG A/ICE LIGHT OFF)

1. FWD WING HTR and FWD WG HTR CONT circuit breakers - CHECK IN
2. Affected side electrical current variation - CHECK switching ON and OFF

If the current variation is 30-40 Amp.

3. Flight - CONTINUE and check periodically the current variation

4. If the electrical current variation is less than 30 Amp. approximately:
5. Leave ice condition as soon as practical

WINDSHIELD HEAT SYSTEM FAILURE

WINDSHIELD ZONE OVERHEAT

L WSHLD ZONE LIGHT ON

1. WSHLD HEAT PRI switch - SET to LO position

R WSHLD ZONE LIGHT ON

2. WSHLD HEAT SEC switch - SET to LO position

If the affected zone light does not extinguish:

3. Affected zone switch - CYCLE LO/OFF when necessary

CABIN DOOR ANNUNCIATOR ILLUMINATED (CAB DOOR LIGHT ON)

WARNING

Do not attempt to check the security of the cabin door in flight. Remain as far from the door as possible with seat belts securely fastened until the airplane has landed.

If the CAB DOOR red light is illuminated or if an unlatched cabin door is suspected:

1. All occupants - SEATED WITH SEAT BELTS SECURELY FASTENED
2. Seat belts and no smoking switch - SET TO NO SMOKING FAST BELT position
3. Cabin Differential Pressure - REDUCE TO LOWEST VALUE PRACTICAL selecting MAN mode or DUMP
4. Oxygen - AS REQUIRED

CAUTION

If the light remains illuminated, land as soon as practical.

BAGGAGE DOOR ANNUNCIATOR ILLUMINATED (BAG DOOR LIGHT ON)

1. Perform the ENGINE SECURING Procedure on the LEFT ENGINE
2. Land as soon as practical performing the SINGLE ENGINE APPROACH AND LANDING Procedure

EMERGENCY EXIT

1. Emergency exit (first window aft of the windshield on right side) - LOCATE
2. Handle - PULL (S.N. 1004 to 1033 airplanes)
   PULL AND TURN LEFT (S.N. 1034 and up airplanes)
3. Emergency exit window - PULL IN

NOTE

The cabin must be depressurized before attempting to open the emergency exit.

AIRPLANE EVACUATION

1. Perform ENGINE SHUT-DOWN Procedure
2. Battery switch - OFF
3. Passengers Door - OPEN

If passengers door does not open, perform the EMERGENCY EXIT Procedure.

3.3 AMPLIFIED EMERGENCY PROCEDURES (GENERAL)

The following paragraphs are presented to supply additional information for the purpose of providing the pilot with a more complete understanding of the recommended course of action in an emergency situation.

During these emergency procedures, it is imperative that the pilot continue good flying technique regardless of the situation.

A complete knowledge of the procedures set forth in this section will enable the pilot to cope with various emergencies that may be encountered. However, this does not diminish the pilots'responsability to maintain aircraft control at all times.

3.3.1 ENGINE FAILURES

Identifying Dead Engine and Verifying Power Loss

If it is suspected that an engine has lost power, the faulty engine must be identified, and power loss must be verified.
First check engine gauges for a drop in ITT and torque.
When the wings are level, the rudder pressure required to maintain directional control will be on the side of the operating engine.

ENGINE SECURING

Begin the securing procedure by pulling the power lever to IDLE and the condition lever to CUT OFF.
Check if ignition switch is set to NORM.
On the fuel control panel, switch to CLOSED position the firewall shut-off valve and switch OFF the fuel pump.
Switch OFF the Autofeather.
Switch OFF the generator and bleed.
Reduce the electrical loads, and consider the use of crossfeed if the fuel quantity dictates.

Engine Failure During Takeoff (General)

The information given in this section provides procedures to be used by the pilot should an engine fail during take off. The pilot must have a thorough knowledge of these procedures so that in the event of a real emergency, the pilot actions will be correct and precise. These skills are best developed through frequent practice of emergency and simulated single engine procedures.
Should an engine failure occur prior to rotation, the takeoff should be immediately aborted.
Should an engine failure occur after rotation, the decision must be made immediately whether to continue the takeoff, single engine, or to abort the takeoff and land straight ahead. This decision can be greatly facilitated by careful preflight planning primarily considering available aircraft performance as affected by weight, ambient conditions, pilot proficiency and the required aircraft performance dictated by airfield requirements.

NOTE

The published Accelerate/Go and Accelerate/Stop distances are Manufacturer data.

ENGINE FAILURE DURING TAKEOFF BEFORE ROTATION

If an engine failure occurs before rotation and there is sufficient runway remaining, maintain directional control, reduce power to idle, and stop straight ahead using brakes and reverse thrust as required.

If insufficient runway remains, pull the condition levers to CUT OFF, switch OFF both generators and close the fuel firewall valves. Maneuver to avoid obstacles and when the airplane has stopped switch OFF the battery.

WARNING

No attempt should be made to continue the takeoff if the engine failure occurs prior to becoming airborne.

ENGINE FAILURE DURING TAKEOFF AT OR AFTER ROTATION

If sufficient runway remains for a safe stop or the decision is made to abort the takeoff, maintain directional control. Pull the power lever of the engines to IDLE and land straight ahead. After touch down use brakes and reverse as required, engaging reverse below 1900 Prop RPM or 5% drop from the set value.

Should a suitable landing area exist, and the decision is made to land the airplane following an engine failure at, or after rotation initiation, the pilot should be aware that performance charts are not presented in this manual for this condition and that the total distance required to stop will exceed the published Accelerate/Stop performance shown in Section 5.

If insufficient runway remains or if the decision is made to continue the takeoff, maintain directional control (banking the plane 5° max toward the operative engine when airborne) and maintain the maximum takeoff power while maintaining torque and ITT within limits.
After assuring that the aircraft will not settle back to the runway, retract the landing gear and accelerate to the "one engine 50 feet height speed" as per Fig. 5-21 (Accelerate/Go Distance Over 50 Feet Obstacle graph) at Section 5 of this Manual.
Accelerate to a speed of 125 KIAS minimum, then retract the flaps and the taxi/landing lights (if applicable) to achieve the max. ramp speed of 132 KIAS or the max. rate of climb speed of 140 KIAS, as appropriate.
Maintain this speed until clearing all obstacles within the immediate vicinity of the airport. After all these obstacles have been cleared, perform the ENGINE SECURING procedure.

NOTE

Airplanes <u>without</u> S.L. 80-0020.

If the left engine is shut down (power lever to IDLE) the landing gear aural warning is activated all the time with the landing gear UP and the flap to MID.

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Airplanes incorporating S.L. 80-0020.

The landing gear aural warning is activated if the flaps are not retracted within approximately 25 seconds after the landing gear has been retracted.

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Place the autofeather arm switch in the OFF position and increase airspeed as required.
Once the above procedures have been completed and the aircraft is at a safe altitude, an airstart may be attempted. (If the start is unsuccessful, complete the ENGINE SECURING Procedure on the inoperative engine).
Whether the start is successful or unsuccessful the aircraft should be landed at the nearest suitable airport performing the SINGLE ENGINE APPROACH AND LANDING Procedure.

WARNING

The decision to continue a takeoff, single engine is primarily predicated upon, but not necessarily limited to, the aircraft's ability to climb on a single engine with the gear extended and flaps in the takeoff position. Prior to flight, review airfield requirements and determine that adequate single climb performance exists, considering aircraft weight, ambient conditions and pilot proficiency, to safely complete the takeoff should an engine fail at or after rotation.

ENGINE FAILURE IN FLIGHT BELOW V_{MCA}

If an engine failure occurs at speed below the V_{MCA}, reduce power on the operating engine to maintain control, then lower the airplane nose to increase speed.
Adjust power as required and secure the inoperative engine as per the ENGINE SECURING Procedure.

ENGINE FIRE (ON GROUND)

If the fire is on the ground near the airplane, it may be possible to taxi to safety.
If engine fire occurs during start or ground operations, immediately place the condition lever of the affected engine in the CUT OFF position. Check the ignition switch in the NORM position. Brake to a stop if the airplane is moving and CLOSE the firewall shut-off valve. Switch OFF the fuel pump.
If a fire extinguisher is installed PUSH the fire extinguisher button.
Call for assistance and, when the airplane has stopped, perform the AIRPLANE EVACUATION Procedure.

ENGINE FAILURE OR FIRE IN FLIGHT

Should an engine fail or fire in flight, maintain 140 KIAS minimum and maintain directional control banking the plane 5° max toward the operative engine. IDENTIFY and VERIFY the affected engine.
Place the power lever of the affected engine to IDLE and the condition lever to CUT OFF; close the firewall shut-off valve and switch OFF the fuel pump, autofeather, generator and bleed. Check if the ignition switch is in NORM position.
If the L or R FIRE light illuminates and the fire extinguisher system is installed, PUSH the fire extinguisher button. Monitor the electrical load and, according to condition of flight (instrument, night, icing, etc.) consider the possibility to reduce the electrical loads.
Crossfeed could be used as desired.

NOTE

The engine fire extinguisher is a single shot system with one cylinder for each engine.

In case of engine failure, follow the appropriate AIR START Procedure in an attempt to start the engine. If the starting attempt is unsuccessful, complete the ENGINE SECURING Procedure for the failed engine. Trim the airplane as necessary and land as soon as practical at a suitable airport.

CAUTION

When conducting a practice run through these procedures, do not close fuel firewall shut-off valves and do not actuate engine fire extinguishers. Fire extinguisher capability has not been evaluated by Airworthiness Authority.

NOTE

Operation in icing conditions above 14000 ft. is limited to 5 minutes, due to a possible lack of efficiency of the engine inlet de-ice boot system.

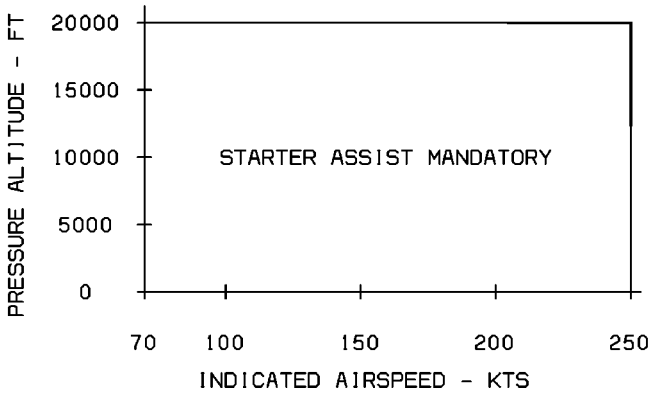
When operating in icing conditions at high altitudes, the pressure to inflate the engine inlet de-ice boot may not be sufficient and consequently the LE or RE BOOTS DE ICE light will not illuminate.
For this reason, if it is necessary to stay in icing condition for a long time, descend below 14000 ft. approximately, in order to increase the pressure delivered to the system.

3.3.2 AIR START

CAUTION

The pilot should determine the reason for engine failure before attempting an air start. Do not attempt a relight if the N_G tachometer indicates zero percent.

RECOMMENDED AIR START ENVELOPE
PROPELLER FEATHERED



Minimum N_G for airstart 13%

NOTE

Air start may be attempted outside of the envelope, or lower N_G provided ITT starting limit is monitored and not exceeded.

NORMAL AIR START

Prior to attempting an air start, ensure that the airspeed and altitude fall WITHIN the AIR START ENVELOPE.

Check that the generator of the operative engine is ON and the generator of the inoperative engine is OFF. Turn OFF the bleed air of the inoperative engine and check the corresponding power lever to IDLE and the condition lever to CUT OFF.

OPEN the firewall shut-off valve of the inoperative engine and place its pump switch to MAIN: FUEL PRESS light on the annunciator panel should be OFF. Turn the inoperative engine start switch to START.
After N_G stabilizes above a minimum of 13%, advance the condition lever to GROUND IDLE and check the engine oil pressure, gas generator temperature and N_G. CHECK OFF engine start switch. Advance the condition lever as required after the propeller has come out from feather and adjust power lever as required. Above 54% N_G turn ON the starting engine generator and bleed air.

NOTE

In case of an unsuccessful start, pull the condition lever to CUT OFF and the power lever to IDLE.
Slow down the airplane to 140 KIAS and after approximately one minute, repeat the AIR START Procedure, using manual ignition (IGN) switch which must be set to NORM after N_G reaches 54%.

AIR START WITHOUT STARTER ASSIST

Prior to attempting an air start, ensure that the airspeed and altitude fall WITHIN the AIR START ENVELOPE.

Check that the generator of the operative engine is ON and the generator of the inoperative engine is OFF. Turn OFF the bleed air of the inoperative engine and check the corresponding power lever to IDLE and the condition lever to CUT OFF.

OPEN the firewall shut-off valve of the inoperative engine and place its pump switch to MAIN: FUEL PRESS light on the annunciator panel should be OFF. At 13% N_G set the ignition switch to IGN. Advance the condition lever to GROUND IDLE and monitor I.T.T. and oil pressure. With an idle of 54% N_G or greater, place to NORM the ignition switch and turn ON the generator.
Adjust condition and power levers as required and turn ON the bleed air.

3.3.3 SMOKE IN COCKPIT

Keep in open position the cockpit curtain, if installed, to help the smoke evacuation.
Actuate MANUAL MASK RELEASE and don mask to supply oxygen to passengers.
Open crew air outlets, set the COCKPIT BLOWER switch to CKPT BLOWER position to increase the air flow in the cockpit area helping smoke evacuation.
Determine if smoke has been originated from electrical system (distinctive odor of smouldering insulation) or from environmental system.

If the smoke originates from electrical system isolate the electrical busses operating the BUS DISC switch and switch OFF one generator at a time in order to identify the faulty circuit. The cabin press controller is not operational in AUTOSCHED and manual operations will be necessary.
Perform the CABIN PRESS AUTO MODE FAILURE procedure.
If the smoke stops, continue the flight and land as soon as practical.
If the smoke does not stop, the cause could be the battery.

Since the stand-by fuel pumps are fed by the battery, it is necessary, before switching OFF the battery and if the FUEL PUMP light is ON, to descend below 25000 ft with JET A-1 fuel and below 14000 ft with JP4 fuel, in order to avoid the possibility of an engine flame out.

Restore both generators ON, pull both ESNTL BUS red breakers on left and right circuit breaker panels and, then, switch OFF the battery.

WARNING

With battery OFF, the loads of the essential bus will be inoperative.

If fire persists, attempt to extinguish it with the portable fire extinguisher, if available.

Land as soon as practical.

If the smoke originates from environmental system, determine if the source is the engine: this can be isolated by the relative air BLEED valve.
Switch BLEED OFF one at a time and when smoke stops, continue the flight with one bleed only.
If the smoke persists, the source could be the ECS package and must be used EMER air bleed.

NOTE

EMER bleed air increases the passenger compartment temperature and it is recommended to avoid prolonged operation at cruise power.

To continue the flight in such a condition it is necessary to descent and fly with cabin unpressurized with emergency bleed OFF. To increase the ventilation perform the DUMP Procedure.
Land as soon as practical.

3.3.4 EMERGENCY DESCENT

If it becomes necessary to descent rapidly to a lower altitude, move the power levers to IDLE and the condition lever to MAX RPM. Switch ON the seat belts and no smoking signs. Assume an airplane attitude with nose down in order to reach the Maximum Operating Speed Limit V_{MO}/M_{MO} as soon as possible.
Follow the speed limit V_{MO}/M_{MO} envelope.

3.3.5 GLIDE

With the flaps and the landing gear UP, the propellers feathered (condition lever in CUT OFF position) the chart below shows the airspeed to be used to attain the least loss in altitude.
Consult the BEST GLIDING DISTANCE diagram on Section 5 "Performance" of this POH to know the horizontal distance covered.

Maximum Glide Speed Chart

Weight - lbs	Speed - KIAS
11550	155
11000	151
10000	144
9000	137
8000	129

Glide Ratio (Refer also to BEST GLIDE DISTANCE graph in Section 5 "Performance") . . . . . 2.3 NM/1000 ft

When operating in sustained icing conditions, the ice build-up on the unprotected parts and the runback ice on the forward and main wings will cause a strong drag increment. In these conditions (ice accretion of approximately 3 inches on the main wing tips) the Glide Ratio may decrease up to 50%.

3.3.6 LANDING EMERGENCIES

LANDING WITHOUT ENGINE POWER

CAUTION

With both generators inoperative only essential, battery and hot battery busses are fed, for approximately 30 minutes depending on loads and battery charge.

If an emergency indicates the need to make an approach and landing without the use of engine power, the airplane should first be configured per the MAXIMUM GLIDE Procedure if sufficient altitude permits.

When both engines have failed, hydraulic and flap systems are not operative in flight since their circuits are not fed by the battery.
In this condition landing gear has to be lowered as per EMERGENCY GEAR EXTENSION Procedure and flaps will be in UP position.

NOTE

Gear extension requires approximately 60 handpump strokes: this procedure requires normally 90 sec.

NOTE

For particular terrain conditions it may be required to land with gear up.

When the landing gear extension has been completed and only if the gear is confirmed to be down and locked, push in the emergency gear selector and switch to HYD position the hydraulic pump.
Once it is assured that the selected landing site will be reached, assume an approach speed increased by 20 KIAS as compared with the flaps DN approach speed (Fig. 5-72).

Place the condition levers in CUT OFF, CLOSE the firewall shut-off valves and switch OFF the fuel pumps.

After touchdown a particular attention has to be paid since brake operation will become harder and landing distances will increase approximately by 125% as compared with the flaps DN landing distance (Fig. 5-72).

The procedure just described applies also when operating in sustained icing conditions with the exception that the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 15 KIAS.
The landing distance, as compared with the flaps MID landing distance (Fig. 5-76), must be increased approximately by 90%.

SINGLE ENGINE APPROACH AND LANDING

WARNING

Do not exceed maximum fuel imbalance (200 lb.).

Ensure that the ENGINE SECURING Procedure is complete. Turn OFF the crossfeed valve if open and advance the condition lever to MAX RPM, extend the flap to MID position and maintain a speed of 129 KIAS minimum.

NOTE

Airplanes without S.L. 80-0020.

If the left engine is shut down (power lever to IDLE) the landing gear aural warning is activated all the time with the landing gear UP and the flap to MID.

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Airplanes incorporating S.L. 80-0020.

The landing gear aural warning is activated all the time with the landing gear UP and the flaps to MID.

* * * * * *

If conditions permit, burn as much fuel as possible.
When landing site is assured lower the landing gear.

When it is certain there is no possibility of go-around, extend the flaps to DN and assume approach speed as per Fig. 5-72.
Adjust the power as required and after touching down, if necessary, apply reverse thrust slowly and cautiously. Reverse thrust must be applied when the prop RPM has dropped to 1900 RPM.
The landing distance, as compared with the flaps DN landing distance (Fig. 5-72), will increase by 30% if reverse thrust is not applied and by 25% if reverse thrust is applied.

The procedure just described applies also when operating in sustained icing conditions with the exception that the flap position must be MID and the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 6 KIAS.
The flaps MID landing distance (Fig. 5-76) must be increased by 30% if reverse thrust is not applied or by 25% if reverse thrust is applied.

SINGLE ENGINE GO-AROUND

To execute a single engine go-around, apply takeoff power to the operating engine. Attain a minimum speed of 120 KIAS and retract flaps to MID position, if they are fully down.
Retract landing gear and increase airspeed to 125 KIAS minimum, then retract the flaps and the taxi/landing lights (if applicable). Increase the airspeed as required.

NOTE

Airplanes without S.L. 80-0020.

If the left engine is shut down (power lever to IDLE) the landing gear aural warning is activated all the time with the landing gear UP and the flap to MID.

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Airplanes incorporating S.L. 80-0020.

The landing gear aural warning is activated if the flaps are not retracted within approximately 25 seconds after the landing gear has been retracted.

* * * * * *

WARNING

When operating in sustained icing conditions, insufficient performance may exist to successfully carry out a single engine go-around.

LANDING WITH PRIMARY LONGITUDINAL CONTROL FAILED

In the event it becomes necessary to use trim for longitudinal control, trim the airplane to 134 KIAS in level flight. Select the longest runway in the area suitable for a low angle approach. Extend landing gear, set flaps to MID position, maintain 130 KIAS and adjust power for a low angle approach, lower the flaps to DN and trim the plane to 121 KIAS. When positioned over the landing runway, flare the airplane using the reduction of power and the longitudinal trim. After landing and when the nose gear is on the runwary, apply reverse as required, when the propeller speed has dropped to 1900 RPM.

The procedure just described applies also when operating in sustained icing conditions with the exception that the flap position must be MID and the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 6 KIAS.

LANDING WITH STABILIZER JAMMED

If elevator pull force is encountered, the stabilizer is jammed in a nose down trim position.
Move, if possible, the center of gravity aft and land as soon as practical to minimize the forward C.G. movement due to fuel-burned.
Extend landing gear and set flaps to MID.
Assume an approach speed increased by 15 KIAS as compared with the flaps DN approach speed (Fig. 5-72). The flaps DN landing distance (Fig. 5-72) shall be increased by approximately 45% if reverse is not applied.

If elevator push force is encountered, the stabilizer is jammed in nose up trim position. Move center of gravity forward if possible.
Extend landing gear and set flaps to DN. Assume the approach speed as per Fig. 5-72.

The procedure just described applies also when operating in sustained icing conditions with the exception that the flap position must be MID, whatever is the stabilizer position, and the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 10 KIAS.
The flaps MID landing distance (Fig. 5-76) must be increased by 25% if reverse thrust is not applied.

LANDING WITH LONGITUDINAL CONTROL SPRING FAILED

Having assumed the up-down spring failure (refer to LONGITUDINAL CONTROL SPRING FAILURE Procedure), land with flaps in MID position.
Assume an approach speed increased by 15 KIAS as compared with the flaps DN approach speed (Fig. 5-72).
After touchdown, engage reverse as required.
The landing distance, as compared with the flaps DN landing distance (Fig. 5-72), must be increased by 40% if the reverse thrust is not applied.

The procedure just described applies also when operating in sustained icing conditions with the exception that the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 10 KIAS.
The flaps MID landing distance (Fig. 5-76) must be increased approximately by 20%.

LANDING WITH AUTOFEATHER SYSTEM INOPERATIVE

The amber AUTOFEATHER light on the annunciator panel is normally illuminated when the system is not armed and the landing gear is down.
If, after having armed the system, the light remains illuminated, the autofeather system has to be assumed inoperative and the landing will be performed with flaps in MID position.
Assume an approach speed increased by 15 KIAS as compared with the flaps DN approach speed (Fig. 5-72).
After touchdown, engage brakes and reverse.
The landing distance, as compared with the flaps DN landing distance (Fig. 5-72), will increase approximately by 35% if reverse thrust is not applied and by 26% if reverse thrust is applied.

The procedure just described applies also when operating in sustained icing conditions with the exception that the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 6 KIAS.
The flaps MID landing distance (Fig. 5-76) must be increased approximately by 10% if reverse thrust is not applied or by 5% if reverse thrust is applied.

LANDING WITH GEAR UP OR UNLOCKED

The event of one or more red UNSAFE lights staying illuminated after a normal landing gear extraction may be originated by a failure of the switch controlling the gear position light: if the hydraulic pressure reading is about 3000 psi a possible jamming has occured: applying positive load factors or sideslipping the airplane may help to solve the problem.
If the hydraulic pressure reading is stabilized around 1000 psi, the gear can be assumed down and locked.

However, if the green light does not illuminate (red UNSAFE still lit), it is necessary to lower the gear as per the EMERGENCY GEAR EXTENSION Procedure.
Should this procedure be unsuccessful too, a tower fly-by probably will allow to know the status of the landing gear legs.

If it has been assumed that the nose gear is up or unlocked, land following the normal procedure, maintaining a nose up attitude to the lowest practical speed.

After the nose touches the ground apply maximum brake and reverse.

If a main gear leg is assumed to be extended, but probably unlocked, perform a landing with normal procedure, touching down on the locked gear, in a nose up attitude.

After touch down sustain the unlocked gear wing, apply reverse cautiously and, when the speed has considerably decreased, apply brakes.

If one or both main gear legs remain retracted, it is recommended to PUSH the emergency gear selector, to switch ON the hydraulic pump and to perform a GEAR UP LANDING Procedure.

Select a suitable landing area, inform ground personnel, brief passengers on use of emergency exit and be sure that all occupants have seat belts and shoulder harnesses secured properly.
If condition permits burn off excess fuel and when ready to land, complete the landing check list as for a normal landing, except that the gear selector lever should be in UP position.

In order to silence the gear warning horn, pull the AURAL WARN circuit breaker prior to extending the flaps.

NOTE

In this case no AURAL STALL WARNING signal is provided.

The flap should be DN for final approach and landing.

Make a normal approach and, when landing is assured, depressurize the airplane, switch off both generators, place the condition lever to CUT OFF, select fuel pumps OFF and fuel firewall shut off valves CLOSED.
Switch off the battery.
Land smoothly, touching down in a level attitude.

All occupants should evacuate as soon as the airplane has stopped.

The procedure just described applies also when operating in sustained icing conditions with the exception that the flap position must be MID and the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 6 KIAS.

ASYMMETRIC FLAP CONDITION LANDING

In case of a flap system failure complete the FLAP SYSTEM MALFUNCTIONS Procedure.
Prior to reaching an altitude of 50 ft. above runway, assure that the landing gear is extended and adjust power as required.
The flaps DN approach speeds and landing distances (Fig. 5-72) shall be increased, depending on the position of outboard wing flaps, as indicated in the following table:

Outboard Flap Position	Speed Increase	Landing Distance Increase (if reverse thrust is not applied)
DN	5 KIAS	10%
MID	15 KIAS	40%
UP	20 KIAS	65%

The procedure just described applies also when operating in sustained icing conditions with the exception that the flaps MID approach speeds and landing distances (Fig. 5-76), must be increased as indicated in the table below.

Outboard Flap Position	Speed Increase	Landing Distance Increase (Fig. 5-76)
MID	10 KIAS	20%
UP	15 KIAS	40%

LANDING WITH FLAPS RETRACTED

In case of an electrical failure in the feeding circuit of the flap systems or a failure in the outboard wing flap system, a landing with no flaps has to be considered.

If conditions permit, burn as much fuel as possible.

Set the condition levers to MAX RPM and use power levers as required.
Assume an approach speed increased by 20 KIAS as compared with the flaps DN approach speed (Fig. 5-72).
Lower the landing gear.
After touchdown, engage reverse when the propeller speed has dropped to 1900 RPM.
The landing distance, as compared with the flaps DN landing distance (Fig. 5-72), will increase approximately by 65% if the reverse thrust is not applied or by 55% if reverse thrust is applied.

The procedure just described applies also when operating in sustained icing conditions with the exception that the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 15 KIAS.
The landing distance, as compared with the flaps MID landing distance (Fig. 5-76), must be increased approximately by 40% if reverse thrust is not applied or by 30% if reverse thrust is applied.

3.3.7 SYSTEM EMERGENCIES

ENGINE SYSTEM FAILURE

LOW OIL PRESSURE

If oil pressure falls between 60 and 90 psi (Yellow Arc) the power should be reduced below 1100 lb-ft torque.

An oil pressure below 60 psi, as indicated by the needle on the gauge at the red radial and OIL PRESS red annunciator light, is unsafe: the ENGINE SECURING Procedure should be performed for the affected engine and a landing made as soon as practical performing the SINGLE ENGINE APPROACH AND LANDING Procedure.

HIGH OIL PRESSURE

If oil pressure rises between 135 psi and 150 psi REDUCE the power on the affected engine and land as soon as practical.

If the oil pressure exceeds 150 psi complete the ENGINE SECURING Procedure for the affected engine and prepare for a SINGLE ENGINE APPROACH AND LANDING Procedure as soon as practical at the nearest suitable airport.

HIGH OIL TEMPERATURE

Normally on the ground the engine OIL COOL switches, on the ENGINES panel, are set to L and R position when the oil temperature reaches 80°C.
When on the ground and the engine oil temperature exceeds 104°C check that the switch of the affected engine is in the L or R position.
If the airplane is airborne, an INCREASE in airspeed and a REDUCTION in power will assist in cooling.
If oil temperature exceeds the limit (110°C) perform the ENGINE SECURING Procedure and land as soon as practical, performing the SINGLE ENGINE APPROACH AND LANDING Procedure.

PROPELLER SYSTEM FAILURE

OVERSPEEDING PROPELLER

If propeller speed exceeds 2020 RPM steady state, remaining below 2200 RPM pull power lever to a lower setting, reduce the propeller speed, and reduce airspeed to the lowest practical airspeed for the flight conditions.

If propeller RPM exceeds 2205 RPM pull Power lever to IDLE.
Pull the condition lever to CUT OFF and complete the ENGINE SECURING Procedure.
Prepare for a SINGLE ENGINE APPROACH AND LANDING Procedure as soon as practical at the nearest suitable airport.

FUEL SYSTEM FAILURE

FUEL PUMP FAILURE

If the L or R FUEL PUMP amber light illuminates on the annunciator panel, it is necessary to CHECK if the corresponding FUEL PRESS light is ON, if the selected pump is the MAIN and the circuit breaker is PUSHED.
If the FUEL PRESS light is not illuminated, the failure is in the main pump, but the stand-by pump is working properly, since this last is automatically engaged. In order to avoid a possible switching between main and stand-by pumps, set the fuel pump switch to STBY.

LOW FUEL PRESSURE

The L or R FUEL PRESS amber light will illuminate whenever the fuel pressure drops below 7 psi. If this should occur, CHECK if the fuel pump switch is set on MAIN and the circuit breaker is PUSHED.
Select the STBY pump to overcome possible poor performance of the main pump. If the light persists two possibilities have to be considered: a faulty pressure switch or a leaking in the engine feeding line.
If the rate of change on the fuel quantity indicator is higher on the affected side a presence of a leakage could be possible.
In this event perform the ENGINE SECURING Procedure and proceed to a landing as soon as practical performing the SINGLE ENGINE APPROACH AND LANDING Procedure. Otherwise a faulty indication has to be assumed and the flight continued.

FUEL FILTER OBSTRUCTED

If the L or R FUEL FILTER amber annunciator light is illuminated, the filter is partially obstructed and the fuel bypass is open.
CHECK the fuel pressure annunciator light:
if it is not illuminated continue the flight and have maintenance check;
if it is illuminated reduce power on the affected engine and land as soon as practical.

WING FUEL BALANCING PROCEDURE

The fuel crossfeed system may be used if during flight it becomes necessary to balance the fuel load or to extend the range as in the case of single engine operations.

Do not take off or land with the crossfeed system engaged.

To operate in crossfeed, turn the "CROSSFEED" knob horizontal, then switch OFF the fuel pump of the low fuel level side.
Monitor the fuel quantity.

NOTE

At high fuel flow rate, the L/R FUEL PRESS amber light may illuminate.

A power reduction will produce the extinguishing of the low fuel pressure light.

ELECTRICAL SYSTEM FAILURE

SINGLE GENERATOR FAILURE

A generator failure is indicated if a GEN amber light is illuminated on the annunciator panel. If this condition occurs, set the switch of the affected generator to RESET, then ON.
If the generator does not reset, place the switch of the affected generator to the OFF position; do not exceed 400 Amp. load on the operating generator. Reduce loads if necessary.

NOTE

With only one generator operating, all busses are fed.

ELECTRICAL OVERLOAD

An electrical overload is indicated by a red flashing light on the multifunction display (MFDI). In this case, monitor the load on the MFDI and reduce the electrical load.
Before reducing the load on the airplane electrical system, consider the condition of flight (instrument, meteorological condition, night, icing, etc.).
A selective method of reducing an electrical load is to remove a system that is not required for the existing flight conditions by turning OFF the corresponding control switch.

DUAL GENERATOR FAILURE

CAUTION

With both generators inoperative only essential battery and hot battery busses are fed, for approximately 30 minutes depending on loads and battery charge.

If both GEN and BUS DISC amber annunciator lights are illuminated, dual generator failure is indicated.
Move both generator switches to RESET then ON to attempt to bring the generators back on line.
If only one generator resets, proceed with single generator failure procedures.
If neither generator resets, select the generator switches to OFF. In this condition, only the essential and hot busses are fed by the battery. Move the bus connecting switch (on left side of the MASTER SWITCHES panel) to EMER, if necessary.

NOTE

With bus connecting switch in EMER position, L/R DUAL FEED BUSSES are powered: limit this operation to prevent further reduction of battery life time.

With both generators failed, normal landing gear extension and flap operation are not possible and only the secondary trim actuator is available for longitudinal trim.
With both generator inoperative and the bus connecting switch not in the EMER position, the angle of attack transmitter is not heated, STALL FAIL amber light will be illuminated and the stall indication will not be reliable.
Land as soon as practical extending the gear as per EMERGENCY GEAR EXTENSION Procedure and performing both the LANDING WITH FLAPS RETRACTED and the CABIN PRESS AUTO MODE FAILURE Procedures.

BATTERY OVERTEMPERATURE

Battery temperature in excess of the limits is indicated by two annunciator lights: one, amber, labeled BAT TEMP, will illuminate when temperature reaches 120°F; the other, red, and labeled BAT OVHT will illuminate at and above 150°F.
If the airplane is on the ground and the BAT TEMP amber light is on, select on the multifunction display (MFDI) BAT TEMP and check temperature: do not take off if the temperature trend is increasing.
If the BAT OVHT red light is on, switch OFF the battery and do not take off.
During flight, if the BAT TEMP amber light is illuminated, monitor the temperature. If BAT OVHT red light is ON, it is necessary to switch off the battery and land as soon as possible.

CAUTION

If battery temperature reached 150°F, either during start or in flight, battery must be removed for bench test and inspection prior to the next flight.

PRIMARY INVERTER FAILURE

An inverter failure is indicated by the PRI INV amber light illuminating.
If this should occur, CHECK avionics for disabled equipment.

NOTE

In the event of primary inverter failure, the primary inverter bus automatically connects to the secondary inverter while the secondary inverter bus disengages and related loads are lost.

SECONDARY INVERTER FAILURE

If the SEC INV amber light illuminates on the annunciator panel, a failure of the secondary inverter is indicated.
Try to bring the inverter back on line setting the SEC inverter switch to OFF position, then to SEC.
If power is not restored, CHECK the avionics for disabled equipment.

AUDIO CONTROL PANEL FAILURE

The total loss of receive and transmit functions may be originated by the audio control panel failure. Should the pilot recognize this condition, the emergency mode of operation must be selected pushing the EMG red button located on the audio control panel.

NOTE

When in emergency mode, the audio control panel allows normal use of transmit and receive functions, with or without power to the system.
Page and interfone functions are lost, while mask/boom microphone can be utilized.

HYDRAULIC SYSTEM FAILURE

When an incorrect pressure of significant duration in the hydraulic system is detected, the HYD PRESS caution (amber) light will illuminate on the annunciator panel.

CAUTION

With the hydraulic pressure at 3000 PSI it is possible to operate the system but hydraulic pump motor must operate for not more than 1 minute.
Do not operate the parking brake with the hydraulic pressure above 1200 PSI.
With the hydraulic pressure above normal value the steering will be more sensitive.
With the hydraulic pump off the steering is inoperative and the brakes are less effective.

When the landing gear is down, check that the hydraulic pump switch is set to HYD position and the breakers labeled HYDR PRESS WRN and HYDR CONT on the left circuit breaker panel are in. If the pressure gauge reading is outside of the 700 ÷ 1300 PSI range, switch OFF the hydraulic pump.

When the landing gear is up, switch OFF the hydraulic pump.

Immediately before landing gear extension, set the pump switch to HYD position.

If an emergency landing gear extension has to be performed, a hand pump provides hydraulic pressure for emergency landing gear extension.

CAUTION

When performing the procedure for training purpose, after completion ascertain the landing gear selector handle has been positively returned to the full down position, to avoid bleeding of hydraulic pressure with subsequent failure of landing gear retraction.

Select the gear handle DN and the hydraulic pump OFF.
PULL the emergency landing gear selector. Note that the emergency procedure is printed on a placard fitted on the control pedestal.

Operate the hand pump handle until all the three green lights illuminate: about 60 strokes and normally 90 seconds are required.
During the hand pump operation, no pressure shall be indicated by the pressure indicator on the control panel.

In case of hydraulic system failure, emergency brake operation is possible with about 50% increase in pedal force. After touchdown engage reverse as required: normal ground roll (Fig. 5-72) will increase approximately 55% if reverse thrust is not applied.

NOTE

When operating in icing conditions, since the landing procedures are performed with flaps MID and higher speed, the ground roll distance with flaps MID (Fig. 5-76) will increase approximately 80% if reverse thrust is not applied.

STEERING SYSTEM FAILURE

If the STEER FAIL red warning light is on, the steering system automatically disengages: nevertheless it is suggested to press the Control Wheel Master Switch. Check off the steering lights. Steering of the airplane is achieved through the use of differential brakes and/or power.

NOSE WHEEL STEER RUNAWAY

As soon as an uncontrolled heading change occurs, press the Control Wheel Master Switch (red button) located on the outboard horn of each control wheel.
Directional control can be maintained using differential braking and asymmetrical power.

LONGITUDINAL CONTROL SYSTEM MALFUNCTION

LONGITUDINAL TRIM RUNAWAY

An uncommanded pitch trim motion, when the system is set to PRI mode, is easily detected by an aural warning signal associated with the stabilizer movement.
Press immediately the Control Wheel Master Switch (red button), located on the outboard horn of each control wheel: this action disconnects the electrical power and the movement will stop.
Select on the PITCH TRIM panel, the SEC mode and trim the airplane moving both halves of the dual switch together to UP or DN as required.

CAUTION

Trim in motion aural warning is not operative when in secondary mode.

PRIMARY LONGITUDINAL TRIM FAILURE

In case of primary longitudinal trim inoperative, check if the PRI PITCH TRIM breaker is IN, then select the longitudinal trim switch, on the pedestal, in SEC mode; in SEC mode the stabilizer movement rate is constant in all the range.

CAUTION

Trim in motion aural warning will not be operative when in secondary mode.

LONGITUDINAL CONTROL SPRING FAILURE

Mechanical failure of the up-down longitudinal control spring could produce:
– at forward C.G. longitudinal control forces slightly more than usual;
– at full rear C.G., high altitude and high speed a light control feel on longitudinal control. In this case reduce airspeed to 210 KIAS above 30,000 feet.

In any case landing procedure should be in accordance with LANDING WITH LONGITUDINAL CONTROL SPRING FAILED Procedure.

FLAP SYSTEM MALFUNCTION

If, during flight or after a maneuver of the flaps has been performed, the FLAP SYNC light will illuminate or abnormal control forces are experienced, check the position of the selector lever and the position of the flaps on the flap position indicator.

1. If it has been assumed that an asymmetry exists between the flaps, maintain control using primary and secondary flight control systems.

NOTE

During flap extension or retraction the most extreme combinations of failures could be:

a. Outboard flaps DOWN, forward wing flaps UP: in this situation a strong pitch down will develop.
The recommended recovering maneuver is: maintain pitch control using wheel, reduce forces with longitudinal trim, then reduce power and airspeed.

b. Outboard flaps UP, one or both forward wing flaps DOWN: in this situation a pitch up and a yawing moment (in case of one only forward wing flap down) will develop.
The recommended recovering procedure is: control pitch attitude using wheel, reduce forces with longitudinal trim, apply pedal as necessary and increase power.
Allow airspeed to decrease.

c. One forward wing flap run away when in landing configuration: in this case a pitch down and a yaw moment will develop.
The recommended recovering procedure is: maintain longitudinal control using wheel and directional control as required.
Reduce forces with trim and reduce power as required.

Intermediate asymmetries result in lower control forces than the above and are easily trimmed down.

After having regained the control of the airplane, reconfigure, if necessary, the remaining flap systems to minimize the dissymmetry, considering that:

a. If the dissymmetry was originated after a single step command (normal flap maneuvering procedure: UP to MID, MID to DN and vice-versa), any position of the flap lever can be selected to reposition the working flap systems toward the failed one.

b. If the dissymmetry was originated after a direct command UP to DN or vice-versa, the reconfiguration is possible only setting the flap lever in the original position (before the failure occured).

2. If the flap positions correspond to the lever setting and/or no significant trim change is detected, do not move the lever any further. Service before next flight.

Landing is performed considering speeds and distances higher than the normal as indicated in the ASYMMETRIC FLAP LANDING Procedure.

PRESSURIZATION AND ENVIRONMENTAL SYSTEM MALFUNCTION

The cabin pressure control system (CPCS) working in the AUTO mode, normally maintains a differential pressure regulated up to 9 psid.
When a failure occurs, the red warning CAB PRESS light is activated on the annunciator panel respectively if the differential pressure exceeds 9.4 psid or the cabin altitude is higher than 9500 ft.

When the cabin altitude gauge indicates an altitude higher than 9500 ft, select the MANUAL MASK RELEASE, don masks, oxygen mask microphone to MASK and verify if both bleed air switches are ON.
Set the cabin pressure control switch to MAN and the manual controller toggle switch to DN. This allows the cabin altitude to decrease at a rate governed by the position of the control knob: increase or decrease as desired assuming a failure on the autoschedule mode.

If the cabin altitude continues to increase, set the emergency bleed air switch to EMER and initiate an emergency descent if required or if the decompression is rapid or explosive. When a comfortable altitude is reached (12000 ft) switch OFF the emergency bleed.

Door sealing is assured by two independent chambers, one inside the other: in case of failure of one or both tubes an amber DOOR SEAL light will illuminate on the annunciator panel.
In this case it is necessary to descent or limit the altitude to 30000 ft or below.
Check the pressurization indicators, and, if the variations indicate rapid change, consider an emergency descent as per EMERGENCY DESCENT procedure.
Supply oxygen to crew and passenger as required.

When the cabin Δp gauge indicates a diffential pressure above 9.4 psid, set to OFF the bleed air switches and to IDLE the power levers, until the cabin differential pressure reaches about 8 psid: at this point the pressurization system can be selected to MAN to perform CABIN PRESS AUTO MODE FAILURE Procedure.

In case it becomes necessary to unload (DUMP) cabin pressure, select, on the oxygen panel, MANUAL MASK RELEASE and don masks if necessary, lift the guard cover of the dump switch and select the DUMP position.
A rapid depressurization will occur until the cabin altitude reaches approximately 13000 ft, when the flight level is higher than 13000 ft. This limit is governed by mechanical pressure relief valves that work independently from the pressurization mode selected (automatic or manual).

After a failure of the autocontroller, perform the following when the airplane is below 10000 ft and before landing: set the cabin pressure control switch to MAN and the manual controller toggle switch to UP; set the manual rate control knob to max rate (if possible).

CAUTION

The Airplane is not approved for landing when pressurized.

After touchdown and before opening the door, set the dump switch to DUMP.

Depending on airplane installation, the environmental control of the cockpit and cabin is ensured through an appropriate package operated by the engines bleed air as follows:

- airplanes with a basic Air Cycle Machine providing hot as well as cold air supply, while an optional Freon Airconditioner can be installed for a supplemental cold air supply
- airplanes with a basic installation consisting of a Heating Unit (Mod. 80-0288), for hot air supply only, coupled to a Freon Airconditioner for cold air supply.

In both installations, if an overheating occurs to the left or right bleed ducts a corresponding red warning light will illuminate on the annunciator panel (L or R BLEED TEMP).
Reducing the power of the affected side engine will extinguish the corresponding light, but if this does not occur, it is necessary to set the bleed air switch to OFF.

When a failure occurs to the temperature automatic control or when an overheating in the cabin air supply duct (red annunciator DUCT TEMP light ON) is detected, set to MAN the temperature control(s) and the MAN HEAT/COOL switch to COOL, or, as applicable, the HI/LO switches to LO.

Maintaining for a while the switch(es) to COOL, or LO, position also the DUCT TEMP light should extinguish: the temperature modulating valve(s) require about 15 seconds operating time from full hot to full cold or viceversa.
If the DUCT TEMP light is ON and persists for further 15 seconds set the emergency bleed air switch to EMER and descent to a comfortable altitude (below 9500 ft), then switch OFF the emergency bleed.

ICE PROTECTION SYSTEM FAILURE

Normal operation of the airplane ice protection system is generally indicated by green advisory lights illuminated on the annunciator panel and/or the anti-ice panel.

A failure or abnormal operation of the forward and main wings ice protection systems, of the engine inertial separator and of the oil cooler inlet lip heater is annunciated by the corresponding green light not illuminated and by the ICE lighted push-button flashing.
In addition, the ICE light will flash when one or more of the forementioned system have not been switched on.

If the amber ICE light does not illuminate in icing condition or remains illuminated for more than 5 seconds (even in clear air), a failure of the sensing probe has occured and the monitoring capability of the ICE light is completely lost: in this conditions, as first, the ENG ICE VANE/ OIL COOLER INTK switches must be checked to the L and R positions, then it is necessary to determine the ice accretion by visual inspection of the probe located on the windshield. In addition, with the failure of the ice detector, the engine inlet de-ice boot cannot operate in AUTO mode.

If the ice accretion rate, on the probe, is approximately 1/4 inch (6 mm) per minute, a heavy ice condition may be assumed: the BOOTS DE ICE switch must set to the TIMER position.
If the accretion is lower, a light ice condition may be assumed, and the boots switch has to be operated cycling TIMER/OFF every 6 minutes approximately.

CAUTION

Continuous cycling of boots during some types of ice encounters may result in failure to remove ice.

A LE or RE BOOTS DE-ICE light not illuminated during the inflation cycle or always illuminated, depends on a controller failure, on the ice detector failure, on a failure of the control valve or of the boot itself.
Check the ENG ICE VANE/OIL COOLER INTK switches are set to the L and R positions.
If the system was operating in AUTO mode, it is necessary to determine the ice forming by visual inspection of the ice accretion probe.
Again, if it is determined that heavy ice conditions exist (accretion rate higher than 1/4 inch per minute) set the BOOTS DE ICE switch to the TIMER position, and, in case of light ice, cycle TIMER/OFF every 6 minutes approximately (see CAUTION above).

When the engine inertial separators are operated and fully deployed (after 30 seconds approximately), the green L and R ENG/OIL A/I lights will illuminate; if one fails to illuminate, observe the engine torque drop of the affected side: if it is not similar to the other engine, a failure of the engine inertial separator is suspected.

Reset the affected side system setting the ENG ICE VANE/OIL COOLER INTK switch to OFF then L or R position: if the normal operating conditions are not restored, leave the ice conditions as soon as possible.

A L or R ENG/OIL A/I green light not illuminated could depend also on an insufficient air temperature of the oil cooler inlet, on a failure of the shut off valve or the thermal switch.
If the green light persists off even with the corresponding N_G above 86%, a failure of the oil cooler inlet heater monitoring system is suspected: flight in icing condition is possible only if the oil temperature has no abnormal increase.

An overtemperature warning light is included in the main wing anti-ice circuit and when it becomes lit, it is necessary to switch OFF the affected side system.
If after 20 seconds approximately the light is still illuminated, power must be reduced as much as possible to sustain flight and ice condition must be left as soon as practical.
If the light extinguishes, switch the system to MANUAL and check the MN WG OVHT light.

CAUTION

In light ice conditions, in order to avoid overheat, a N_G between 88% and 91% is recommended. Should the red MN WG OVHT light illuminate, the affected system must be turned OFF for one minute approximately.

If the green lights of the main wing anti-ice system (L or R MN WG A/ICE) are not illuminated, increase power momentarily: if the light remains off, switch the system to OFF for approximately 10 seconds, then MANUAL and check the ITT variation.

If after approximately 30 seconds the light is still off and ITT has not increased by 20°C approximately, a control valve failure has occured: switch OFF both forward and main wings anti-ice systems and leave ice conditions as soon as possible.
If the light illuminates or remains off, but the ITT increases approximately 20°C, leave the affected system to MANUAL, paying attention to the MN WG OVHT warning light (see CAUTION above).

A main wing anti-ice advisory light, flashing when the system operates in AUTO mode, indicates that an overheat sensor has failed. Operation in AUTO mode is still possible owing to the redundancy of the overheat warning circuits, but operation in MANUAL mode must be avoided.

An overtemperature warning light is also included in the forward wing anti-ice circuit and when it becomes lit, it is necessary to switch OFF the affected side system: disattending this procedure, damage could result to the forward wing leading edge structure.
Leave ice condition as soon as practical.

In case of a forward wing anti-ice system failure check on the MFDI (selecting L or R GEN position) the variation of electrical current switching the affected system ON and OFF.
If the variation is 30-40 Amp., continue the flight; if the variation is less than 30 Amp. approximately, leave ice condition as soon as practical.

WINDSHIELD HEAT SYSTEM FAILURE

When the heating sensor detects an overheating condition, the red L or R WSHLD ZONE light will illuminate on the annunciator panel.
If the light does not extinguish after primary or secondary heating systems are switched to LO mode (PRI or SEC WSHLD HEAT switches to LO) it is necessary to cycle the affected zone switch to LO then OFF position, when necessary, to obtain clear view.

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SECTION 4

NORMAL PROCEDURES

4.0 GENERAL

This section describes the recommended procedures for the conduct of normal operations for P 180 Avanti airplanes.
Normal procedures associated with those optional systems and equipment which require handbook supplements are presented in Section 9 (Supplements).
These procedures are provided as a source of reference and review and to supply information on procedures which are not the same for all airplanes. Pilots should familiarize themselves with the procedures given in this section in order to become proficient in the normal operations of the airplane.
The first portion of this section is a short form checklist which supplies an action sequence for normal procedures with little emphasis on the operation of the systems.
The second portion of the section is devoted to amplified normal procedures which provide detailed information and explanations of the procedures and how to perform them. This portion of the section is not intended for use as an in-flight reference due to the lengthy explanations. The short form checklist should be used for expeditious reference or response.
In addition, a discussion of normal systems operation, stall characteristics, V_{MC} demonstration, intentional single engine operations, is presented in the amplified procedures.

4.1 AIRSPEEDS FOR NORMAL OPERATIONS

The following airspeeds are those which are significant to the operation of the airplane. These figures are for standard airplanes flown at maximum take off weight (or otherwise specified) under normal condition at sea level. For additional airspeed information see Section 2.

	SPEED	KIAS
a.	Two engines Recommended Climb Speed up to 30000 ft. Reduce speed 1 KIAS for each 1000 ft. above 30000 ft.	160
b.	Two engines Best Angle of Climb Speed	133
c.	Two engines Best Rate of Climb Speed	154
d.	Two engines Approach Speed at Maximum Landing Weight For different weights refer to Section 5 Fig. 5-76 (flap MID) and Fig. 5-72 (flap DN)	
	Flap MID	129
	Flap DN	121
e.	Balked Landing Climb Speed	130
	Flap MID	115
	Flap DN	
f.	Maximum Demonstrated Crosswind Velocity	25
g.	Maximum Operating Mach Number	.67
h.	Maximum Operating Speed (See V_{MO}/M_{MO} chart in Section 2)	260
i.	Design Maneuvering Speed	
	At 11550 lb	199
	At 7700 lb	177
j.	Maximum Flap Operating Speed	
	UP to MID	170
	MID to DN	150
k.	Maximum Flap Extended Speed	
	Flap MID	180
	Flap DN	175
l.	Maximum Landing Gear Operating Speed	180
m.	Maximum Landing Gear Extended Speed	185
n.	Maximum Landing Light Operating Speed	160
o.	Maximum Landing Light Extended Speed	160
p.	Rough Air Penetration Speed at or below 25000 ft. Reduce speed 5 KIAS for each 5000 ft above 25000 ft.	195

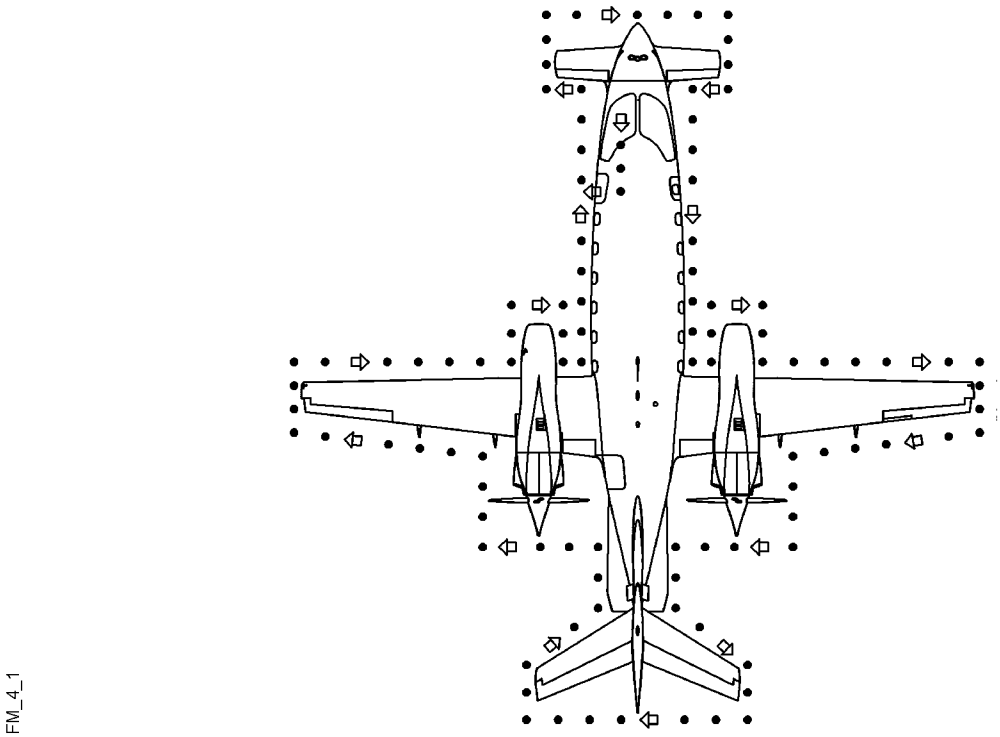

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Figure 4-1. WALK-AROUND

4.2 NORMAL PROCEDURES CHECK LIST

4.2.1 PREFLIGHT CHECK

NOTE

Ensure the battery clamp has been reconnected to the battery, if previously disconnected for prolonged airplane ground parking.

COCKPIT

1. Airplane records - CHECK
2. Parking brake - SET LOCKED
3. Control locks - REMOVE
4. Flight controls - CHECK FREE
5. Electrical switches - OFF
6. Circuit breakers left and right panel - IN
7. Gear handle - DN
8. Battery switch - BAT
9. MFDI self test - CHECK

10. Bus voltage - CHECK

CAUTION

If bus voltage is less than 21.5 VDC, the battery must be serviced or replaced before flight.
If bus voltage is between 21.5 and 23.0 VDC, allow 15 minutes of ground power unit battery recharging.

11. CAB DOOR warning light - CHECK ON (with door open)
12. Battery temperature - TEST
13. Annunciator panel - TEST
14. Engine fire detector - TEST
15. Fuel quantity system - TEST AND CHECK QUANTITY
16. Gear lights - CHECK THREE GREEN AND TEST
17. Engine instrument panel - TEST
18. Fuel crossfeed valve - CHECK OFF
19. Trim surfaces - NEUTRAL
20. Battery switch - OFF
21. Oxygen pressure - CHECK
22. Oxygen masks - CHECK
23. Windshield and lateral windows - CHECK FOR CLEANLINESS

FORWARD WING AND NOSE SECTION

1. Windshield left side - CHECK CONDITION AND CLEANLINESS
2. Flap - CHECK
3. Static wicks - IN PLACE, CONDITION
4. Surface - CHECK CONDITION AND CLEANLINESS
5. Nose gear - CHECK
6. Steering connecting pin - CHECK properly installed
7. Tires - CONDITION AND SLIPPAGE
8. Gear doors - CHECK
9. Chock - REMOVE
10. Antenna - CHECK
11. LH pitot tube - CHECK
12. Landing lights door - CHECK CLOSED
13. Nose radome - CHECK
14. Surface - CHECK CONDITION AND CLEANLINESS
15. OAT sensor - CHECK
16. RH pitot tube - CHECK
17. Flap - CHECK
18. Static wicks - IN PLACE, CONDITION
19. Ice detector - CHECK
20. Antennas - CHECK
21. Windshield right side - CHECK CONDITION AND CLEANLINESS

FUSELAGE (RIGHT SIDE)

1. General condition - CHECK
2. Emergency exit - CHECK LOCKED
3. Antennas - CHECK
4. Static ports - CLEAR
5. Stall warning cone - CHECK
6. Windows - CHECK
7. Landing gear - CHECK
8. Tire - CONDITION AND SLIPPAGE
9. Brake lining wear indicators - CHECK FOR MINIMUM
10. Ventral strobe light - CHECK
11. Antennas - CHECK
12. Chock - REMOVE
13. Gear doors - CHECK
14. Fuel vent - CLEAR
15. Fuel tank sump - DRAIN
16. Fuel vent system - DRAIN (before first flight of the day)
17. Battery vent - CLEAR
18. Ground test/refuelling panel - TEST

NOTE

If any annunciator light is already illuminated before the test or remains illuminated after the test, refer to Section 8 of this Manual for servicing.

CAUTION

On the airplanes equipped with the upgraded ground test/refuel panel, P/N 727-0439/02 (installed with Mod. No. 80-0467 or SB No. 80-0194), a real chip detection condition occurs, in the related engine oil, if the L ENG OIL or R ENG OIL annunciator light is flashing (3 Hz rate, 40% on and 60% off) while the GROUND TEST switch is held in the SYST position. Have an immediate maintenance check as per the applicable Engine Manual.

19. Ground test/refuelling panel door - CLOSE
20. Single point refuelling port cap - CHECK INSTALLED AND SECURED
21. Single point refuelling panel door - CLOSE

RIGHT WING

1. Surface - CHECK CONDITION AND CLEANLINESS
2. Generator cooling intake - CHECK
3. Air intake and de-ice boot - CHECK
4. Oil cooler intake - CHECK
5. Nacelle - CHECK CONDITION
6. Ice bypass vane - CHECK
7. Engine oil vent - CLEAR
8. Engine fuel pump drain - CHECK FOR LEAKAGE
9. Starter generator pad drain - CHECK FOR LEAKAGE
10. Stall strip - CHECK
11. Position light - CHECK
12. Static wicks - IN PLACE, CONDITION
13. Aileron - CHECK
14. Aileron trim tab - CHECK
15. Outboard flap and flap track fairings - CHECK
16. Nacelle cowling - CHECK
17. Fire extinguisher pressure gauge - CHECK (if installed)
18. Air conditioning precooler intake - CHECK
19. Propeller bearing vent - CHECK
20. Combustion chamber drain - CHECK FOR LEAKAGE
21. Engine exhaust ducts - CHECK
22. Propeller blades and spinner - CHECK CONDITION AND FREE MOVEMENT
23. Inboard flap - CHECK

REAR FUSELAGE (RIGHT SIDE)

1. General condition - CHECK
2. Gravity fuel filler cap - CHECK CLOSED
3. Air conditioning intake - CLEAR
4. Air conditioning outlet - CLEAR
5. Ventral fin - CHECK
6. Tail cone - CHECK CONDITION

EMPENNAGE

1. Surface - CHECK CONDITION
2. VHF/NAV antennas - CHECK
3. Rudder - CHECK
4. Rudder trim tab - CHECK
5. Static wick - IN PLACE, CONDITION
6. Elevator - CHECK
7. Stabilizer position - CHECK
8. Static wicks - IN PLACE, CONDITION
9. Antennas - CHECK
10. Recognition and strobe lights - CHECK

REAR FUSELAGE (LEFT SIDE)

1. General condition - CHECK
2. Ventral fin - CHECK
3. Tail cone - CHECK CONDITION
4. Main junction box (baggage comp.) - CHECK circuit breakers IN
5. Baggage - SECURED with the restrain net
6. Baggage door - LOCK

LEFT WING

1. Inboard flap - CHECK
2. Air conditioning precooler intake - CHECK
3. Propeller bearing vent - CHECK FOR LEAKAGE
4. Combustion chamber drain - CHECK
5. Engine exhaust ducts - CHECK
6. Propeller blades and spinner - CONDITION AND FREE MOVEMENT
7. Fire extinguisher pressure gauge - CHECK (if installed)
8. Nacelle cowling - CHECK
9. Engine oil vent - CLEAR
10. Engine fuel pump drain - CHECK FOR LEAKAGE
11. Starter generator pad drain - CHECK FOR LEAKAGE
12. Outboard flap and flap track fairings - CHECK
13. Aileron - CHECK
14. Static wicks - IN PLACE, CONDITION
15. Position lights - CHECK
16. Surface - CHECK CONDITION AND CLEANLINESS
17. Stall strip - CHECK
18. Oil cooler air intake - CHECK
19. Wing ice inspection light - CHECK
20. Air intake and de-ice boot - CHECK
21. Nacelle - CHECK
22. Generator cooling air intake - CHECK
23. Ice bypass vane - CHECK

FUSELAGE (LEFT SIDE)

1. Landing gear - CHECK
2. Tire - CONDITION AND SLIPPAGE
3. Brake linings wear indicators - CHECK FOR MINIMUM
4. Chock - REMOVE
5. Fuel vent - CLEAR
6. Fuel vent system - DRAIN (before first flight of the day)
7. Fuel tank sump - DRAIN
8. Battery vent - CLEAR
9. Ground power unit (GPU) receptacle door - LOCKED
10. Gear doors - CHECK
11. General condition - CHECK
12. Windows - CHECK
13. Static ports - CLEAR
14. Oxygen safety discharge indicator - CHECK GREEN
15. Entrance door - CHECK

FURTHER CHECKS

Before first flight of the day:

1. Condition levers - CUT OFF
2. Battery switch - BAT
3. L/R fuel firewall shutoff valves - TEST, THEN CHECK OPEN
4. Crossfeed - TEST, THEN CHECK OFF

WARNING

Takeoff is not authorized if during the tests of fuel firewall valves and crossfeed valve the corresponding INTRAN lights remain illuminated.

5. L/R fuel pump switches - MAIN
6. L/R fuel filters - DRAIN
7. L/R fuel pump switches - OFF
8. External lights - CHECK (Prior to night flight)
9. Battery switch - OFF

4.2.2 BEFORE ENGINE STARTING

1. Entrance door - SECURE handles and check indicators

WARNING

Assurance that the door is locked is by correct alignment of all visual indicator marks.

2. Emergency exit handle - PROPERLY POSITIONED;
   Handle lock pin - REMOVED (S.N. 1034 and up airplanes)
3. Crew/passenger briefing - COMPLETE
4. Belt - SECURE
5. Seats - ADJUST
6. Rudder pedals - ADJUST
7. Switches - CHECK OFF

CAUTION

Failure to select AVIONICS master switch to the OFF or COM1 ONLY position during the engine start up or shutdown may result in equipment failure.

8. Engine control lever friction - ADJUST
9. Emergency gear selector - PROPERLY POSITIONED
10. Battery switch - BAT
11. Volt - CHECK

NOTE

If bus voltage is between 23.0 - 23.5 VDC, it is recommended to connect a ground power unit before attempting engine start.

12. Battery temperature - CHECK

CAUTION

No battery engine starting must be attempted if battery temperature is over 120°F (BAT TEMP caution light ON).

13. Fuel quantity - CHECK
14. Parking brake - CHECK LOCKED
15. Seat belts and no smoking signs - ON
16. Avionics master switch - COM1 ONLY if engine start up clearance is required

NOTE

If engine start up clearance requires prolonged period of time, battery charge can be saved switching the MASTER switch from NORMAL to BUS DISC.
Select NORMAL just before engine start.

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4.2.3 ENGINE STARTING

WARNING

During ground operation with engine at low N_G, depending on ambient temperature and/or altitude, check ITT and advance condition lever to maintain ITT under 750°C.

NORMAL START

First engine start may be made using either the aircraft battery or the ground power unit (GPU). A GPU start is made with the battery switch set to BAT.

CAUTION

Whenever the gas generator fails to light up within 10 sec. after moving the condition lever, shut fuel off by retarding the condition lever and setting the starter switch to OFF. Allow a 30 sec. fuel draining period followed by a 15 sec. dry motoring run before attempting another start. If, for any reason, a starting attempt is discontinued, allow the engine to come to a complete stop and then accomplish a dry motoring run.

1. Anti Coln light - GND
2. Power lever - IDLE
3. Condition lever - CUT OFF
4. Firewall shut off valve - CHECK OPEN
5. Fuel pump - TEST AND CHECK MAIN
6. Fuel pressure light - CHECK OFF
7. Bleed air switches - CHECK OFF
8. Ignition switch - CHECK NORM
9. Propeller - CLEAR
10. Engine start switch - START
11. Condition lever - (at 13% N_G) GROUND IDLE
12. ITT - MONITOR (1000°C Max. 5 sec.)
13. Oil pressure - CHECK INCREASING
14. N_G RPM - CHECK INCREASING
15. Engine start switch - CHECK OFF (at about 40% N_G)

NOTE

At first starting of the day a starting cycle time exceeding 30 seconds may be observed on some engines. In this event, an alternate ground starting procedure is suggested, rearranging the above steps from 10 to 15 as follows:

- Engine start switch - START
- Condition lever - (at 13% N_G) FLIGHT IDLE
- ITT - MONITOR (1000°C Max. 5 sec.)
- Oil pressure - CHECK INCREASING
- N_G RPM - CHECK INCREASING
- Engine start switch - CHECK OFF (at about 40% N_G)
- Condition lever - (at 50% N_G) GROUND IDLE

With engine at ground idle setting check the following conditions:

a. ITT - 750°C Max.
b. Oil pressure - 60 psi Min.
c. Oil temperature - 110°C Max.
d. N_G RPM - 54% MIN
e. N_P RPM - 900 RPM MIN.

16. Condition lever - ADVANCE TO FLIGHT IDLE
17. GPU (unless needed for second engine start) - DISCONNECT
18. Generator (if GPU is not used or disconnected) - ON
19. Ammeter - CHECK
20. Hydraulic pump switch - HYD (Pressure - CHECK; light OFF)

ENGINE DRY RUN (MOTORING)

1. Power lever - IDLE
2. Condition lever - CUT OFF
3. Ignition breaker (IGN SYS) - OUT
4. Fuel pump - OFF
5. Engine start switch - START
6. Engine start switch (after 15 sec.) - OFF

Second engine start may be made using either the GPU or the cross-start procedure.

CROSS-START PROCEDURE (ONE ENGINE OPERATING)

CAUTION

Whenever the gas generator fails to light up within 10 sec. after moving the condition lever, shut fuel off by retarding the condition lever and setting the starter switch to OFF. Allow a 30 sec. fuel draining period followed by a 15 sec. dry motoring run before attempting another start. If, for any reason, a starting attempt is discontinued, allow the engine to come to a complete stop and then accomplish a dry motoring run.

1. Condition lever (operative engine) - FLIGHT IDLE
2. Generator (operative engine) - CHECK ON
3. Ammeter - CHECK below 160 Amp (below 140 Amp after a first engine prolonged starting)
4. Firewall shutoff valves - CHECK OPEN
5. Power lever (inoperative engine) - IDLE
6. Condition lever (inoperative engine) - CUT OFF
7. Fuel pumps - MAIN
8. Fuel pressure light - CHECK OFF
9. Bleed air - OFF
10. Ignition switch - CHECK NORM
11. Propeller - CLEAR
12. Engine start switch - START
13. Condition lever (inoperative engine) - (at 13% N_G) GROUND IDLE
14. ITT - MONITOR (1000°C Max. 5 sec)
15. Oil pressure - CHECK INCREASING
16. N_G RPM - CHECK INCREASING
17. Engine start switch - CHECK OFF (at about 40% N_G)

NOTE

At first starting of the day a starting cycle time exceeding 30 seconds may be observed on some engines. In this event, an alternate ground starting procedure is suggested, rearranging the above steps from 12 to 17 as follows:

- Engine start switch - START
- Condition lever - (at 13% N_G) FLIGHT IDLE
- ITT - MONITOR (1000°C Max. 5 sec.)
- Oil pressure - CHECK INCREASING
- N_G RPM - CHECK INCREASING
- Engine start switch - CHECK OFF (at about 40% N_G)
- Condition lever - (at 50% N_G) GROUND IDLE

With engine at ground idle setting check the following conditions:

a. ITT - 750°C Max.
b. Oil pressure - 60 psi Min.
c. Oil temperature - 110°C Max.
d. N_G RPM - 54% MIN
e. N_P RPM - 900 RPM MIN.

18. Condition lever - BOTH GROUND IDLE
19. Generator - ON
20. Ammeter - CHECK

CAUTION

Avoid GROUND IDLE setting with electrical load above 200 A.

GPU START PROCEDURE

A GPU start is made with battery switch set to BAT: for more information on this procedure refer to Section 8 of this AFM/POH.
Use first engine start procedure. After both engines have been started:

1. GPU - DISCONNECT
2. EXT. PWR annunciator - CHECK green light OFF
3. Generators - ON

4.2.4 BEFORE TAXI

1. Inverters - SELECT PRI and SEC
2. Avionics switch - ON
3. Environmental temperature - AUTO AND TEMP SELECT AS NECESSARY

NOTE

On airplanes equipped with Heating Unit coupled with a Freon Airconditioner as basic installation combined operation of both the Heating Unit and the Freon Airconditioner up to 20,000 ft. may be required. Refer to Supplement 9 at Section 9 of this POH for the Freon Airconditioner operations.

4. Cockpit blower - AS REQUIRED
5. Bleed air switches - SET to L and R positions
6. Pressurization Auto/Man switch - AUTO and CHECK SELF TEST

NOTE

The FAULT indication light on the control panel should momentarily illuminate (3 seconds maximum) during self test. If FAULT indication light fails to extinguish or re-illuminate, set AUTO/MAN switch to MAN and then back to AUTO to repeat self test.

CAUTION

No flight should be initiated in the automatic mode if the FAULT light fails to extinguish.

7. Auto Sched/Cab sel switch - AUTO SCHED
8. Landing altitude - SET
9. Barometric correction - SET
10. Rate selection - SET (PIP mark)
11. Engine oil coolers - AS REQUIRED
12. Gyros - CHECK
13. Radios - SET and CHECK
14. Air Data Computer - TEST (if installed)
15. Overspeed warning - TEST
16. Hydraulic system - TEST
17. Steering system - TEST
18. Steering - TAXI
19. Pitot/stall/static heat - CHECK
20. Stall warning - TEST
21. Flap system - TEST

WARNING

No takeoff authorized with non symmetrical flap configuration or annunciated failure.

22. Flaps - MID
23. Trim systems - TEST and set for take-off

CAUTION

Failure to set the correct trim for take-off may result in high rotation forces, delayed rotation and a substantial increase in take-off distance.

24. Ice detector - TEST
25. WSHLD heat - CHECK
26. Engine ice vane/oil cooler intake - CHECK
27. Engine inlet de-ice boots - CHECK

WARNING

Do not operate engine inlet de-ice boots below –40°C.

No takeoff authorized with frost, snow or ice adhering to propellers, windshields, powerplant installation and pitot/static ports, or with snow or ice adhering to the wings, vertical and horizontal stabilizer or control surfaces.

NOTE

Perform Main and Fwd wing anti ice tests if ice conditions are known or expected.

28. Anti ice Main wing - TEST
29. Anti ice Fwd wing - TEST
30. EFIS - TEST (if installed)
31. Autopilot - TEST (if installed)
32. Radio altimeter - TEST (if installed)
33. Annunciator panel - TEST and CHECK CAB DOOR warning light flashing
34. BAG DOOR AND CAB DOOR warning lights - CHECK OFF
35. Parking brake - RELEASE

4.2.5 TAXIING

1. Brakes - CHECK (avoid excessive use)
2. Steering system - OFF on a level runway
3. Airplane - CHECK no tendency to yaw left or right
4. Steering system - TAXI
5. Prop reverse - CHECK
6. Prop feathering - CHECK
7. Flight instruments - CHECK

4.2.6 ENGINE RUN UP

1. Parking brake - SET LOCKED
2. Condition levers - MAX RPM
3. Power levers - Advance to 2000 RPM
4. Propeller overspeed - TEST
5. Propeller governing - CHECK to minimum RPM
6. Autofeather system - TEST

WARNING

No takeoff authorized with autofeather inoperative.

7. Autofeather switch - ARM
8. Parking brake - RELEASE

4.2.7 BEFORE TAKEOFF

1. Circuit breakers - CHECK IN
2. Anti coln lights - AIR
3. Windshield heat - AS REQUIRED
4. Pitot/Stall/Static heat - ON
5. Seat belts and no smoking signs - ON
6. Flight instruments - SET and CHECK
7. Engine gauges - CHECK
8. Warning and caution lights - CHECK OFF
9. Transponder - SET
10. Bleed air switches - CHECK to L and R positions

NOTE

When operating from high altitude airports with high OAT, it may be necessary to switch off both bleed air to reduce engine ITT.

11. Fuel pumps - CHECK MAIN
12. Condition levers - CHECK MAX RPM
13. Flaps - CHECK MID
14. Longitudinal trim - CHECK TAKEOFF SET
15. Aileron trim - CHECK NEUTRAL
16. Rudder trim - CHECK NEUTRAL
17. Flight controls - CHECK FREE
18. Steering - TAKEOFF
19. Oil cool - OFF
20. Taxi/landing lights - AS REQUIRED
21. Navigation lights - AS REQUIRED
22. Ice protection systems - AS REQUIRED

4.2.8 TAKEOFF

1. Power levers - ADVANCE to MAXIMUM TAKE-OFF power

WARNING

Before applying full power, be sure that the condition levers are set to MAX RPM: takeoff distance given in Sec. 5 may not be assured.

2. Autofeather - CHECK ARMED (green AUTOFEATHER lights ON)

WARNING

If ambient temperature is below –25°C, it is necessary to operate the main wing anti-ice and the engine ice vane systems before applying full power to ensure that the autofeather is armed.
When takeoff is completed and autofeather disengaged, the ice protection can be switched OFF.

3. Engine gauges - WITHIN LIMITS
4. Steering (not over 60 KIAS) - OFF
5. Rotation - REFER to Section 5 of this Manual Fig. 5-19
6. Airspeed - Accelerate to 120 KIAS until above 50 ft.
7. Taxi/landing lights (below 160 KIAS) - OFF
8. Gear (below 180 KIAS) - UP
9. Autofeather (above 150 KIAS) - OFF
10. Flaps (below 170 KIAS) - UP

4.2.9 CLIMB

1. Climb power - SET
2. Airspeed - REFER to Section 5 of this Manual
3. Seat belts and no smoking signs - AS REQUIRED
4. Pressurization - CHECK
5. Windshield heat - LO or HI as necessary

4.2.10 CRUISE

1. Cruise power - SET
2. Airspeed - REFER to Section 5 of this Manual
3. Engine instruments - CHECK
4. Pressurization - CHECK
5. Environmental control system - CHECK

4.2.11 DESCENT

1. Windshield heat - AS REQUIRED
2. Pressurization - CHECK
3. Environmental control system - CHECK

4.2.12 BEFORE LANDING

1. Seat belts and no smoking signs - ON
2. Condition levers - MAX RPM
3. Gear (below 180 KIAS) - DN; CHECK 3 GREEN
4. Flaps (below 170 KIAS) - MID
5. Autofeather (below 150 KIAS) - ARM, CHECK LIGHT
6. Landing lights (below 160 KIAS) - AS REQUIRED
7. Flaps on final (below 150 KIAS) - DN

CAUTION

When operating in icing conditions, the landing procedure must be performed with flaps MID and the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 6 KIAS.

8. Autopilot/Steering - OFF
9. Cabin pressure barometric condition - CHECK

4.2.13 LANDING

Prior to reaching 50 ft. above landing surface:

1. Landing gear - CHECK DN (3 green lights)
2. Flaps - CHECK DN

CAUTION

When operating in icing conditions, the landing procedure must be performed with flaps MID and the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 6 KIAS.

Steering engagement during landing is prohibited.

3. Approach speed - REFER to Section 5 of this Manual Fig. 5-72
4. Power - AS REQUIRED
5. Condition levers - CHECK MAX RPM

After touchdown:

6. Brakes - AS REQUIRED
7. Reverse - AS REQUIRED; engage reverse below 1900 prop RPM or 5% drop from the set value

NOTE

When landing at aft C.G. initiate flaps retraction before actuating reverse power.

8. Reverse - AVOID USE below 40 KIAS, approximately.

At landing completed:

9. Condition levers - GROUND IDLE
10. Steering - ENGAGE TAKE OFF (if necessary)

4.2.14 BALKED LANDING

1. Power levers - MAX POWER
2. Engine gauges - WITHIN LIMITS
3. Airspeed - 115 KIAS
4. Flaps (below 150 KIAS) - MID

CAUTION

When operating in icing conditions, the balked landing procedure must be performed with flaps MID and the airspeed must be 130 KIAS.

5. Gear (after climb established) - UP
6. Flaps (below 170 KIAS) - UP
7. Airspeed - 160 KIAS

4.2.15 AFTER LANDING

1. Power levers - IDLE
2. Steering - TAXI (if necessary)
3. Flaps - UP
4. Radar - OFF
5. Transponder - OFF
6. Anticollision lights - GROUND
7. Taxi/landing lights - AS REQUIRED
8. Ice protection equipment heat - OFF (if applicable)
9. Autofeather - OFF
10. Cabin altitude / Δp - CHECK Landing Field / Zero

NOTE

In the event of landing with severe brake use an adequate brakes cooling time is required before a successive takeoff.

4.2.16 SHUTDOWN

1. Parking brake - SET

NOTE

If brakes are very hot, do not set parking brake.

2. Avionics switch - OFF

CAUTION

Failure to select AVIONICS master switch to the OFF position during the engine shutdown may result in equipment failure.

3. Inverters - OFF
4. Bleed air - OFF
5. Power lever - CHECK IDLE
6. Condition lever - CHECK GROUND IDLE

NOTE

Allow the engine to stabilize for a minimum of one minute at minimum obtainable ITT.

7. Hydraulic pump - OFF

WARNING

If there is any evidence of fire within the engine after shutdown, proceed immediately as described under "ENGINE DRY RUN" Procedure.

8. Condition lever - CUT OFF
9. Fuel pump switches - OFF
10. All electrical switches - OFF
11. Battery switch - OFF

NOTE

During the shutdown ensure that the compressor decelerates freely.

CAUTION

The passenger door may be opened 10 seconds after the passenger upper door handle has been rotated to OPEN position.

12. Passenger door - OPEN

4.2.17 AFTER SHUTDOWN

1. Engine oil level - CHECK (after the last flight of the day)

NOTE

Perform the engine oil level check within 10 minutes after engine shutdown.

2. Propellers blades - CLEAN and CHECK (after the last flight of the day)
3. Control locks - INSTALL
4. Emergency exit handle lock pin - INSTALL (S.N. 1034 and up airplanes)
5. Wheels chocks - PLACE
6. Covers - INSTALL

7. Propeller restrainers - ATTACH
8. Tie-down ropes - AS REQUIRED

NOTE

If the airplane is supposed to be parked for more than 2 days unplug the battery clamp from the battery in the baggage compartment.

4.2.18 OPERATION IN ICING CONDITIONS

1. ENG ICE VANE/OIL COOLER INTK switches - SET to L and R positions
2. BOOTS DE ICE switch - AUTO

NOTE

The surface ice protection systems must be activated approximately 30 seconds after the actuation of engine ice protection systems to avoid a quick increase of engine ITT.

3. L and R MAIN WING switches - AUTO
4. FWD WING switches - SET to L and R position
5. WSHLD HEAT PRI and SEC switches - CHECK LO
6. N_P RPM - MAINTAIN 2000 RPM.
7. Ice protection systems advisory lights - CHECK occasionally

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4.3 AMPLIFIED NORMAL PROCEDURES (GENERAL)

The following paragraphs are provided to supply detailed information and explanation of the normal procedures necessary for the operation of the aircraft.

4.3.1 PREFLIGHT CHECK

The airplane should be given a thorough preflight and walk-around check. To expedite certain checks, a person in the cockpit may operate certain controls and switches, which are observed by a ground observer. The preflight should include a determination of airplane's operational status, a check that necessary papers are on board and in order, and a computation of weight and center of gravity limits, take-off and landing distances and inflight performance.
Baggage should be weighed, stowed and tied down.

NOTE

Ensure the battery clamp has been reconnected to the battery, if previously disconnected for prolonged airplane ground parking (more than two days).

COCKPIT

Check that necessary papers are on board and in order.
After entering the cockpit, remove the control locks, if installed, and check flight controls for proper movement. Set the parking brake, pressing on the pedals while pulling out and rotating in vertical position the PARKING BRAKE handle.

Check that all electrical switches are OFF; circuit breakers should be IN. Ensure that the gear selector handle is in the DN position.
Turn the battery switch to BAT and check the MFDI self test routine. Select BUS VOLTS on the MFDI and check the bus voltage.

CAUTION

If bus voltage is less than 21.5 VDC, the battery must be serviced or replaced before flight.
If bus voltage is between 21.5 and 23.0 VDC, allow 15 minutes of ground power unit battery recharging.

With the door open check that the CAB DOOR warning light is illuminated.
The preflight tests of certain system essential to safe operation of the airplane should be performed selecting the proper function on the SYS TEST panel and momentarily pressing the button located in the center of the rotary selector switch.

The battery temperature test is performed selecting the position BAT TEMP on both the MFDI and the SYS TEST panel and pressing the pushbutton located in the center of the selector knob. This activates a simulation of overtemperature: initially the instrument reading is 190°F and both BAT TEMP and BAT OVHT lights on the annunciator panel shall illuminate.
When the reading reaches 150°F the red BAT OVHT light will extinguish and when the reading is 120°F the amber BAT TEMP light will extinguish.

Set the rotary switch of the SYS TEST panel to ANN LTS, press and hold the central button: this activates the annunciator panel and the MASTER WARNING/MASTER CAUTION lamps test and the cabin door annunciator circuitry.

On the annunciator panel all the lights should illuminate steady while L and R FIRE and CAB DOOR should flash; on the instrument panel the red MASTER WARNING should flash and the amber MASTER CAUTION should light up steady.
Releasing the button on the rotary switch all the annunciator panel lights will return in the original condition, while MASTER WARNING/MASTER CAUTION will be reset pressing on the light itself. Set the rotary switch of the SYS TEST panel to the FIRE DET position and press the test button: the two red lights on the annunciator panel, labelled L FIRE/R FIRE should start to blink, together with the L and R ENG FIRE EXT lighted pushbuttons, if the optional fire extinguisher system is installed.

Perform the fuel quantity system test selecting on the SYS TEST panel the FUEL QTY position and pressing the central button: the fuel indicator pointer will reach the full scale then zero while all the digits will be illuminated.
On the annunciator panel L and R LOW FUEL amber light should be illuminated up to the end of the test.
Check the fuel quantity.

The three green landing gear lights should be illuminated.
The three red lights GEAR UNSAFE can be checked setting the switch, on SYS TEST panel, to LDG GR position and pressing the test button: this will light up the UNSAFE lamps and activate the gear warning horn.

NOTE

Setting the AVIONICS master switch to the COM1 ONLY or ON position is required for the actuation of the warning horn.

Digital readings of the engine instruments are tested selecting, on the system test panel, the position ENG. INSTR. and pressing the test button, which causes the illumination of all the digit segments and on the combined oil pressure/oil temperature instrument the red and amber limitation lights.

Verify fuel CROSSFEED valve knob OFF.

Set the trim surfaces to neutral.

Turn the battery switch OFF after these checks.

Check the oxygen pressure gauge on the left side of the cockpit to ascertain that there is sufficient oxygen for the intended flight. (Full service is 1850 PSI at 70° F. Refer to oxygen system service paragraph in Section 8 for other temperatures).

The pilot/passenger oxygen system control should be in the AUTO-NORMAL position. Check for oxygen flow to the pilot and copilot oxygen masks by placing masks on face and breathing. Assure, by the flow indicators, that all oxygen flow has ceased.
Be sure that there is a functional oxygen mask for each occupant and that all masks are properly stowed.
Verify if the windshield and lateral windows are clean.

A complete walk-around check should be continuely performed during each preflight. A set pattern should be established as in Fig. 4-1, starting at the cabin door and proceeding forward, completely around the airplane, and terminating upon return to the cabin door.

FORWARD WING AND NOSE SECTION

Check the condition and cleanliness of the windshield, then proceed along the trailing edge of the left forward wing trailing edge.

Visual check the wing, flap and hinges for damage.

Surface should be free of ice, snow, frost, debris or other extraneous substances: particular attention must be paid on the cleanliness of the top and bottom wing surface in order to achieve an extended laminar flow.

Static wicks should be firmly attached and in good condition.

The nose landing gear should be examined.
The condition of the components of the strut, the gear doors, the gear micro switches etc. should appear sound, and fittings, attachments, hoses, lines, screws, hinges etc., should be secure.
There should be no sign of hydraulic fluid leakage in the area of strut or in the wheel well.
Examine the tires for cuts, bruises, cracks and excessive wear.
Check if steering connecting pin is properly installed.
Check the antennas for condition.
If the wheel chocks have been employed, they should be removed before taxing.

If the pitot tubes covers have been installed, they must be removed and the pitot head openings checked and ensured they are clear of any obstruction.
If the pitots and static ports heat operation is to be checked, the battery switch must be turned to BAT and the corresponding switches, on the ANTI ICE panel to ON: use caution since pitots and static ports can become very hot.

Check the radome for damage.

The landing light door should be closed and OAT sensor checked for condition.

FUSELAGE (RIGHT SIDE)

Check the general condition of the right side of the fuselage.
The emergency exit window should be secure and flush with the fuselage skin. All side windows should be clean and without defects.

Check the conditions of DME and transponder antennas.

The openings in the static port should be clean and unobstructed.
The stall warning transducer should be checked for security and freedom of movement.

The landing gear should be examined with care. Refer to placard for correct servicing instruction and tire pressure.
The condition of the components of the strut, the gear doors, the brakes, the gear micro-switches etc., should appear sound, and fittings, attachments, hoses, lines, screws, hinges etc. should be secure. There should be no sign of hydraulic fluid leakage in the wheel well, nor in the area of strut and brake.
Check the brake lining wear indicator: they must protrude from their housing.
The tire should be examined for cuts, bruises, cracks and excessive wear.

Remove wheel chock, if employed.
Check gear doors and actuating mechanism for excessive play.
Check the integrity of the ventral strobe light and antennas.

Fuel vent, located on the bottom-side of the fuselage should be clear of obstruction.
Before the first flight of the day, drain the fuel vent system operating the drain valve through the hole located on the side of the fuselage close to the gear doors: the outlet is located inside the wheel well.
Battery vent outlet should be clear.
Drain the fuel tank sump, operating the relative valve located in the wheel well: it is recommended, as a general rule, that at each fuel drain, fuel be collected and examined in a clear container so that it can be visually checked for water and sediment: use the draining tool P/N 80-909172-801 or equivalent.

Open the ground test/refuelling panel door and perform the hydraulic and engine oil system test.

NOTE

If any annunciator light is already lit before the test or remains illuminated after the test, refer to Section 8 of this Manual for servicing.

Turn and hold the momentary GROUND TEST switch to the LAMP position checking the following:

– all the four red and the two amber annunciator lights will come on: failed lights should be replaced and re-tested before flight;
– on the airplanes equipped with the upgraded ground test/refuel panel, P/N 727-0439/02 (embodied with Mod. No. 80-0467 or SB No. 80-0194), the L and R ENG OIL annunciator lights should flash with a rate of 3 Hz (40% on and 60% off) showing the proper operation of the panel chip detection monitoring circuitry: a simulated chip detection condition is generated allowing the warning system test.

Turn and hold the momentary GROUND TEST switch to the SYST position checking the following: L and R ENG OIL, HYD FILTER and, after a few seconds, HYD LEVEL red lights should illuminate and then extinguish releasing the switch.

CAUTION

On the airplanes equipped with the upgraded ground test/refuel panel, P/N 727-0439/02 (installed with Mod. No. 80-0467 or SB No. 80-0194), a real chip detection condition occurs, in the related engine oil, if the L ENG OIL or R ENG OIL annunciator light is flashing (3 Hz rate, 40% on and 60% off) while the GROUND TEST switch is held in the SYST position. Have an immediate maintenance check as per the applicable Engine Manual.

NOTE

The "Low Engine Oil Level Condition" is automatically displayed by the steady illumination of the related L or R ENG OIL light, a "Chip Detection Condition", if any, is displayed by the flashing of the related L or R ENG OIL light only after moving and holding the GROUND TEST switch to the SYST position.

After the test, close the panel door.

Pilot must check that the single point refuelling port cap is installed and properly secured, then close the single point refuelling access door.

RIGHT WING

Check the general condition of the right wing and make the same checks and procedures as performed on the forward wing.
At the nacelle, check the condition of the surface.

If the protective caps were installed in the air inlet and in the exausts openings, they should be removed. Inlet and exhaust openings should be checked for obstruction.

Check the condition of inlet pneumatic deicer boots: it should be free from defects and flat against the inlet cowling. Oil cooler, generator and precooler air inlet should be free of obstructions.

Check the ice bypass vane for correct alignment and clear of obstruction.

Oil vent, engine fuel pump drain and starter generator pad drain should be clear of obstruction.

Stall strip on the leading edge and position lights at the tip of the wing should be intact.

Check the aileron gap seal for integrity.

The right aileron includes a trim tab which must be checked for neutral position, proper movement, excessive free play and security. Tab neutral position corresponds, when the aileron is aligned with the wing, to a downward setting of approximately 3/8" (10 mm.).
Static wicks should be firmly attached and in good condition.
Check outboard and inboard flaps for correct alignment and free play: check also the flap track fairings.

Check the pressure of the fire extinguisher bottle: nominal value at 21°C (70°F) ambient temperature is 360 ± 25 psig: for other temperature see Figure 7-32 in Sect. 7 of this POH.

Check the rear cowling of the nacelle for integrity and the air conditioning precooler intake for obstruction.

Propeller bearing vent should be checked for obstruction and combustion chamber drain for leakage.
Exhaust-stubs should be secure.
The propeller blades and spinner should be free of cracks, nicks, dents and other defect and should spin freely.

There should be no indication of leakage of fluid in the area of hub or on the engine nacelle.

REAR FUSELAGE (RIGHT SIDE)

Check the general condition of the fuselage surface.
Verify if the air conditioning air intake and outlet are free from obstructions.
Check on top of the fuselage if the gravity fuel filler cap is properly closed.
Verify the condition of tail cone and ventral fin.

EMPENNAGE

All surfaces of the empennage should be examined for damage, cleanliness and operational interference.
Check rudder and rudder trim tab for proper movement and excessive free play. Tab neutral position corresponds, when the rudder is aligned with the fin, to a deflection to the right of approximately 3/8" (10 mm.).
Stabilizer position, when longitudinal trim indicator is 0° (neutral), is approximately horizontal and the reference line, marked on stabilizer is aligned with 0° reference mark on vertical fin.
Verify the condition of recognition and strobe light, antennas and static wicks.

REAR FUSELAGE (LEFT SIDE)

Check the general condition of the fuselage surface.
Verify the condition of tail cone and ventral fin.
Check IN the circuit breakers of the main junction box located inside the baggage compartment.
Ascertain the baggage is properly secured with the prescribed restrain net.
Lock the baggage door.
Verify if the ground power unit (GPU) receptacle is locked.

LEFT WING

Repeat the same checks and procedures as already performed on right wing in the reverse order.
Check the ice inspection light on the nacelle for integrity.

FUSELAGE (LEFT SIDE)

Repeat the same checks and procedures followed during the inspection of the right side of the forward fuselage.

Check that the battery vent is clear of obstuction.

Check that the entrance door attachments are secure and hinges operational.

Check the oxygen overpressure safety discharge disk indicator. This green disk, when missing or ruptured, indicates bottle pressure has exceeded about 2800 psi and is empty. This overpressure system will actuate only under the most adverse circumstances: therefore determine the cause of the overpressure, and replenish oxygen before flight.

FURTHER CHECKS

Before the first flight of the day it is required that the fuel filters are drained, while the fuel firewall shutoff valves and the crossfeed valve are checked for proper operation.

Ensure that the condition levers are set to CUT OFF.

Set the battery switch to the BAT position.

The fuel firewall shutoff valves are tested moving the corresponding switch (L or R FW VALVE) from CLOSE to OPEN position.
The transit amber lights (L and R F/W V INTRAN) shall illuminate momentarily, while the position amber lights (L and R F/W V CLSD) shall turn off. After the test has been performed check the fuel firewall shutoff valves are set to OPEN position.

The crossfeed system is tested turning the crossfeed knob either left or right.
The transit amber light (XFEED INTRAN) should momentarily illuminate and the position amber light (FUEL XFEED) should be on.
Set the knob to OFF position: again the transit light (XFEED INTRAN) should illuminate momentarily, while the position light (FUEL XFEED) should be off.

WARNING

Take off is not authorized if during the tests of fuel firewall valves and crossfeed valve the corresponding INTRAN lights remain illuminated.

The fuel filters are located at the bottom of each nacelle, close to the ice vane by-pass opening. Draining operation requires that the battery and both fuel pumps are switched on: for this reason the draining is accomplished at this step of the preflight check, in order to save the battery power and to leave the airplane unguarded, with electrical power ON, for a minimum time.

Before finishing the ground check, and if a night flight is anticipated, ensure that all exterior lights are operational: for this check the battery switch should be positioned to BAT and the various systems tested one at a time.

After completed the above checks switch OFF the battery.

Check the ground in the area of the airplane for evidence of fuel, oil, or operating fluid leakage.

4.3.2 BEFORE ENGINE STARTING

After the preflight interior and exterior checks have been completed and the airplane is determined ready for flight, the entrance door should be secured and all occupants seated.
When all occupants are boarded, the pilot should check that the cabin door is properly closed and latched. The lower door support cables should be held in position, if necessary, so that they will not interfere with the closing of the door.
Insert the locking pin in the lower door handle and ensure the correct alignement of the two overcentre indicators, observing through the inspection windows. Close the upper passenger door rotating the handle anticlockwise then clockwise to the STOW position and secure the handle whith the spring loaded guard. Ensure the correct alignement of the two overcentre indicators and of the pin position indicator, observing through the inspection windows.

WARNING

Assurance that the door is locked is by correct alignement of all visual indicator marks.

Ensure that the emergency exit handle is in the correct position. In addition on S.N. 1034 and up airplanes ensure that the red flagged emergency exit handle lock pin is removed.
Passengers should be briefed on the use of seat belts, the emergency exit, supplementary oxygen, ventilation control, seat adjustment, comfort facilities, etc.

Secure belts, adjust seats and rudder pedals.

All the switches should be OFF.

CAUTION

Failure to select AVIONICS master switch to the OFF or COM1 ONLY position during the engine start up or shutdown may result in equipment failure.

Adjust the engine control lever friction.

Emergency gear selector should be checked if properly positioned.

Switch the battery to BAT and check the voltage, which should not be less than 23.5 VDC.
To accomplish this check it is necessary to set the rotary switch of the multifunction display indicator (MFDI) to BUS VOLTS position.

NOTE

If bus voltage is between 23.0 and 23.5 VDC, it is recommended to connect a ground power unit before attempting engine start.

Select on the MFDI the position BAT TEMP and check the battery temperature.

CAUTION

No battery engine starting must be attempted if battery temperature is over 120°F (BAT TEMP caution light ON).

Check the fuel quantity.

Before starting the engines check the parking brake is locked and turn the seat belts and no smoking signs ON.

If engine start up clearance is required set the avionics master switch to the COM1 ONLY position.

NOTE

If engine start up clearance requires prolonged period of time, battery charge can be saved switching the MASTER switch from NORMAL to BUS DISC.
Select NORMAL just before engine start.

4.3.3 ENGINE STARTING

NORMAL START

WARNING

During ground operation with engine at low N_G, depending on ambient temperature and/or altitude, check ITT and advance condition lever to maintain ITT under 750°C.

First engine start may be made using either the aircraft battery or the ground power unit (GPU). GPU start is made with the battery switch set to BAT.

CAUTION

Whenever the gas generator fails to light up within 10 sec. after moving the condition lever, shut fuel off by retarding the condition lever and setting the starter switch to OFF. Allow a 30 sec. fuel draining period followed by a 15 sec. dry motoring run before attempting another start. If, for any reason, a starting attempt is discontinued, allow the engine to come to a complete stop and then accomplish a dry motoring run.

Set the anticollision light to GND.

Power lever should be set to IDLE and condition lever to CUT OFF.
The fuel firewall shutoff valves should be OPEN.

Fuel pumps should be checked for proper operation. Set left pump switch to STBY position: amber L FUEL PRESS light should be off and amber L FUEL PUMP light should be on: set the switch to MAIN position, both lights should be off.
Repeat the same procedure for the right pump.

Turn the fuel pump switch to MAIN and check off the fuel pressure amber light. Bleed air switches should be OFF. Ignition switch should be in NORM position. Verify if the propeller is clear and set the engine start switch to START.
When engine speed reaches 13% N_G advance the condition lever to GROUND IDLE. Engine temperature ITT must not exceed a maximum of 1000°C for more than 5 seconds. Observe N_G and oil pressure rise; at about 40% N_G, the engine start switch will automatically disengage.

NOTE

At first starting of the day a starting cycle time exceeding 30 seconds may be observed on some engines. In this event, an alternate ground starting procedure is suggested, rearranging the above steps as follows:
Set the start switch to START; when engine speed reaches 13% N_G advance the condition lever to FLIGHT IDLE.
Engine temperature ITT must not exceed a maximum of 1000°C for more than 5 seconds; observe N_G and oil pressure rise; at about 40% N_G, the engine start switch will automatically disengage. Retard the condition lever to GROUND IDLE.

With the engine at ground idle setting, the following indications should be read on the engine instruments:
engine temperature (ITT) 750°C maximum, oil pressure minimum 60 psi, oil temperature 110°C maximum, engine speed 54% N_G minimum, propeller speed 900 RPM minimum.
Advance the condition lever to FLIGHT IDLE.
Disconnect the GPU unless needed for second engine start.
If GPU has not been used or is disconnected turn ON the generator: the corresponding amber light on the annunciator panel will extinguish. Check for a positive ammeter reading and a voltmeter reading of 27.5 to 28 volts: these checks are accomplished setting the rotary switch of the multifunction display indicator (MFDI) to the corresponding position respectively L/R GEN and BUSS VOLTS.
Turn the hydraulic pump switch to HYD and observe a reading of about 1000 PSI; check off the amber HYD PRESS light on the annunciator panel.

ENGINE DRY RUN (MOTORING)

To perform an engine dry run, set the power lever to IDLE and condition lever to CUT OFF; pull out the ignition breaker (IGN SYS). Fuel pump switch should be set to OFF. Turn the start switch to START and after 15 seconds to OFF. Observe the starter operating limits set forth in Paragraph 2.4 of this Manual.

CROSS START PROCEDURE (ONE ENGINE OPERATING)

Second engine start may be made using either the GPU or the cross start procedure.

CAUTION

Whenever the gas generator fails to light up within 10 sec. after moving the condition lever, shut fuel off by retarding the condition lever and setting the starter switch to OFF. Allow a 30 sec. fuel draining period followed by a 15 sec. dry motoring run before attempting another start. If, for any reason, a starting attempt is discontinued, allow the engine to come to a complete stop and then accomplish a dry motoring run.

The condition lever of the operating engine should be set at FLIGHT IDLE.
Check ON the generator of the operating engine.
Before starting the second engine, allow one or two minutes for battery recharging: observe on the ammeter (MFDI) a reading of less than 160 Amp.
In the event of a first engine prolonged (more than 40 seconds) starting a longer battery recharging time should be allowed waiting for an ammeter reading of less than 140 Amp. before the second engine start.
The fuel firewall valves should be OPEN.
The power lever of the inoperative engine should be at IDLE and the condition lever at CUT OFF.
Set the fuel pump switch of the inoperative engine to MAIN and check OFF the fuel pressure light.
The bleed air switch should be OFF.
Ignition switch should be in NORM position. Verify if the propeller is clear. Turn the engine start switch to START and when the engine speed reaches 13% N_G advance condition lever to GROUND IDLE.
Engine temperature ITT must not exceed a maximum of 1000°C for more than 5 seconds. Observe N_G and oil pressure rise; at about 40% N_G start switch will automatically disengage.

NOTE

At first starting of the day a starting cycle time exceeding 30 seconds may be observed on some engines. In this event, an alternate ground starting procedure is suggested, rearranging the above steps as follows:
Set the start switch to START; when engine speed reaches 13% N_G advance the condition lever to FLIGHT IDLE.
Engine temperature ITT must not exceed a maximum of 1000°C for more than 5 seconds; observe N_G and oil pressure rise; at about 40% N_G, the engine start switch will automatically disengage.
Retard the condition lever to GROUND IDLE.

With the engine at ground idle setting, the indications on the engine instruments should be as in the normal start.
Set both engine condition levers to GROUND IDLE.

CAUTION

Avoid GROUND IDLE setting with electrical load above 200 A.

GPU START PROCEDURE

A GPU start is made with the battery switch set to BAT. Refer to Section 8 of this handbook for more information.
Use first engine start procedure.
After both engines have been started disconnect the GPU (green light EXT POWER will extinguish) and switch both generators ON.

4.3.4 BEFORE TAXI

Before taxing be sure that wheel chocks have been removed and the GPU disconnected.
Check that battery switch is to BAT and generators are ON.
Select both inverters (PRI and SEC) and turn the avionics switch ON.
Set the environmental mode selector switch(es) to AUTO and select temperature as necessary.

NOTE

On airplanes equipped with Heating Unit coupled with a Freon Airconditioner as basic installation combined operation of both the Heating Unit and the Freon Airconditioner up to 20,000 ft. may be required. Refer to Supplement 9 at Section 9 of this POH for the Freon Airconditioner operations.

The cockpit blower can be selected as as required.
Both bleed air switches should be ON (L and R position respectively).
On the cabin pressurization control panel, set the mode switch to AUTO and check the self test.

NOTE

The FAULT indication light on the control panel should momentarily illuminate (3 seconds maximum) during self test. If FAULT indication light fails to extinguish or re-illuminate, set AUTO/MAN switch to MAN and then back to AUTO to repeat self test.

CAUTION

No flight should be initiated in the automatic mode if the fault light fails to extinguish.

AUTO SCHED/CAB SEL switch should be turned to AUTO SCHED and landing altitude, barometric correction and rate selection should be set turning the three knobs labeled, respectively A, B and R.
Set ON the OIL COOL switch when the oil temperature reaches approximately 80°C.
Check gyros system for proper operation by observing unflagged condition on primary and secondary attitude indicators and on pilot's RMI and EHSI.
Check and set communication radios and radio navigation equipment.
If the Air Data Computer is installed perform the system test as explained in the Supplement 2 at Section 9 of this POH.
Select on the SYS TEST panel the OVSP WRN position and press the test button: the aural OVERSPEED WARNING tone is activated.

Select on the SYS TEST panel the HYD position to perform the hydraulic system test: pushing the button the amber HYD PRESS light will illuminate and the pressure gauge reading increases at abuot 1300 PSI. Releasing the button the light will extinguish and the pressure indication will return at the initial value.

To test the steering system press the momentarily two steps control wheel button (black) to the first step: the system is not engaged.
Press the button to the second step: the STEER TO white light, located on the LANDING GEAR panel will illuminate.
Pressing again to the first step the STEER TAXI amber light will start to blink, while pressing to the second step the take off position will be engaged and the white STEER TO light will illuminate.
Pressing the control wheel Master Switch red button the steering will be disengaged and the steering lights (STEER TO or STEER TAXI, depending on the mode selected) will extinguish.
Set the knob of the SYS TEST panel to STEER position and push the central button: the STEER FAIL red light on the annunciator panel will illuminate when the steering is engaged in either takeoff or taxi condition and remains illuminated until the control wheel Master Switch is pressed.

After completed this procedure the steering can be set for taxiing: position to TAXI the steering switch.

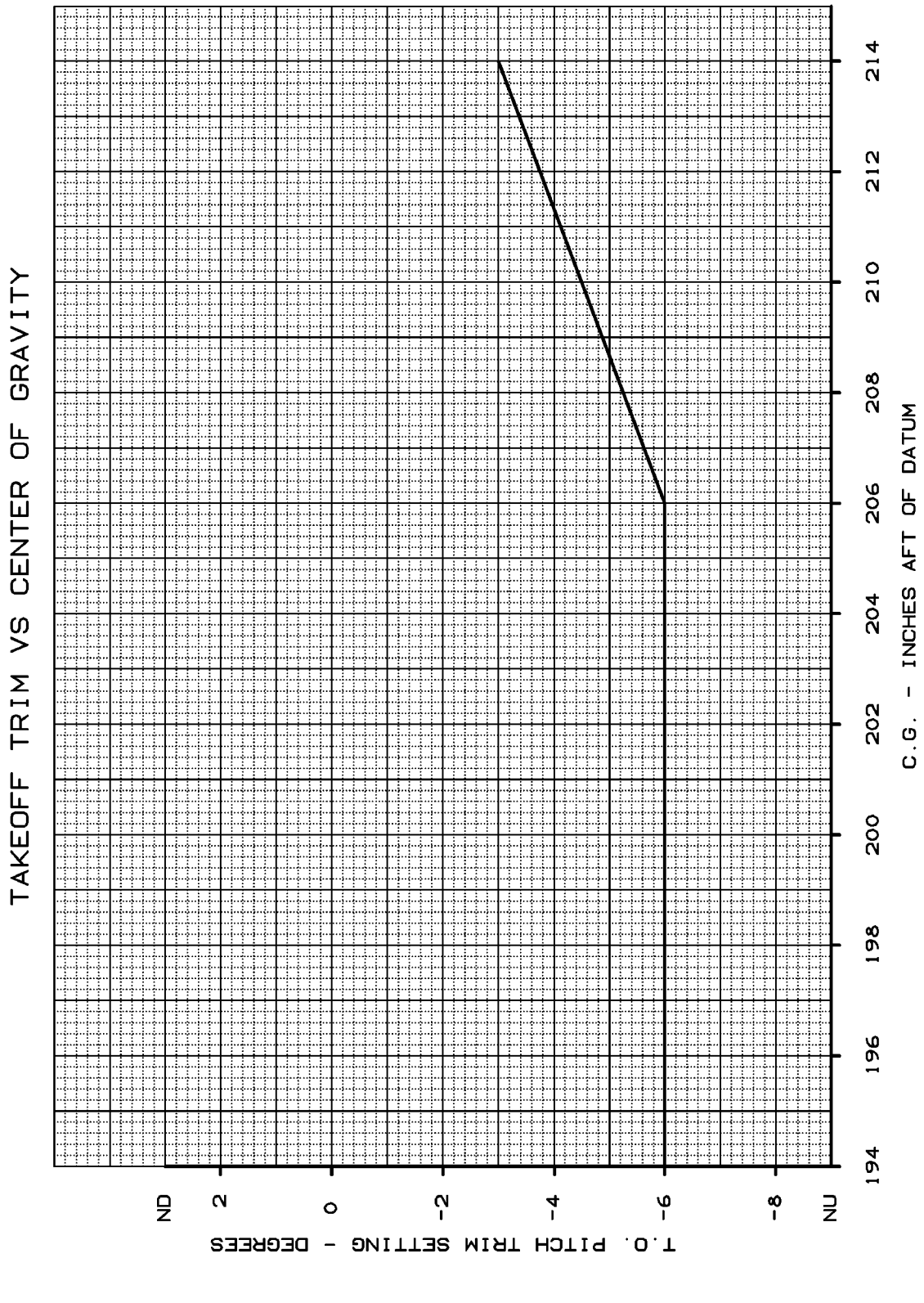

Figure 4-2. TAKEOFF PITCH TRIM VS. CENTER OF GRAVITY

Check the continuity of pitots, static ports and angle of attack transducer heating system by operating, on the ANTI ICE panel, the PITOT/STATIC HTR switches: an appreciable electrical current increment should be read on the MFDI display when the left switch is set to the L & STALL position and a further increase should be observed when the right switch is set to the R STATIC position (10 Amp. approximately total).
If the angle of attack sensor heater has failed, the STALL FAIL amber light will illuminate on the annunciator panel: verify the STALL FAIL amber light is not illuminated, then proceed to the stall warning system test.

The stall warning test is a computer-automated sequence, initiated by closure of the test button, after having selected the STALL position on the SYS TEST panel: a transmitter failure is simulated and the amber STALL FAIL light on the annunciator panel will illuminate then extinguish after a time interval between 15 and 20 seconds. The red STALL light on the pilot instrument panel will illuminate then extinguish, after 2 ÷ 4 seconds, and the aural warning horn will be activated. Thereafter the STALL FAIL amber light will illuminate again (while CPU resets) and extinguish after one or two seconds. After the test, set to OFF position the L & STALL switch.

Select on the SYS TEST panel the FLAP position and perform the flap system test.
With the flap lever in UP position press the test button located in the centre of selector switch: FLAP SYNC amber light, on the annunciator panel, will illuminate; releasing the button the light must extinguish.

Move the flap lever to MID position and check proper deployment of each surface on flap monitor display: forward wing flaps shall start to move approximately 9 seconds after the outboard panels.
Move for about one second, stop for 3 seconds then start again together with the inboard surfaces. During the flaps deployment and after the stop in the MID position, the FLAP SYNC light will not illuminate.
Press the test button: FLAP SYNC light will not illuminate.
Move the flap lever to DOWN position and check the operation on flap monitor: all flap surfaces start together and during the deployment and after the stop, the FLAP SYNC light will not illuminate.
Press the test button: FLAP SYNC light will illuminate.
Set the flap lever in MID position and check the operation: during the retraction and after the MID position has been reached, the FLAP SYNC light will not illuminate.
Return the flap lever to UP position and check the operation on the flap monitor display: again during the movement and after the UP position has been reached, the FLAP SYNC light will not illuminate.

WARNING

No takeoff authorized with non symmetrical flap configuration or annunciated failure.

Having completed this procedure, the flaps can be positioned for take-off: select MID and check for the SYNC LIGHT not illuminated.
Longitudinal trim system test is accomplished by first turning the PITCH TRIM switch to SEC: trim motion shall be easily checked observing the indicator and the movement of the control column.
The up-down spring, which connects the elevator to the horizontal stabilizer, when the stabilizer is in the range between full nose down and approximately -4° nose up, pushes the control column against the forward stop.
As the pitch trim is operated toward nose up position and the stabilizer reaches approximately -6° nose up, the control column moves aft, giving a positive check of the spring integrity.

WARNING

If the control column does not move as described, do not take off and have a maintenance check.

Continue the longitudinal trim system test moving each half of the NOSE DN-OFF-NOSE UP switch separately to NOSE UP then NOSE DN: trim motion shall not occur.
Move both halves simultaneously to each position: trim motion shall occur.

Operate trim switches on either control wheel to NOSE UP then NOSE DN: trim motion shall not occur.

Turn the PITCH TRIM switch to PRI: with the primary system operating an aural trim in motion signal is activated for the longitudinal trim.
Operate both halves of the pedestal trim switch simultaneously to NOSE UP, then NOSE DN: trim motion shall not occur. Check the proper operation of pilot's control wheel longitudinal and lateral trim switch.
Without depressing arming button, move switch to LWD, RWD, NOSE UP and NOSE DN: trim motion shall not occur.
Depress arming button: again no trim motion shall occur.
Depress arming button and move the switch to LWD, RWD, NOSE UP and NOSE DN: trim motion shall occur as shown by the appropriate indicator.
Repeat this procedure for copilot's control wheel trim switch.
Move the copilot's control wheel trim switch and trim in the opposite direction using pilot's control wheel trim switch: this action shall override copilot's trim.
Repeat for each switch position.

Check the proper operation of the pilot's control wheel Master Switch (MSW).
Move the control wheel trim switch to NOSE UP, then press the MSW switch (below trim switch): trim motion shall stop.
Same behaviour shall occur trimming to NOSE DN.

Move the rudder trim switch on the pedestal to NOSE LEFT: press MSW on pilot's control wheel, trim motion shall stop.
Same behaviour shall occur trimming to NOSE RIGHT.

Repeat the procedure for co-pilot's control wheel Master Switch.

Rudder trim system is tested moving each half of the rudder trim switch, on the pedestal, separately to NOSE LEFT then NOSE RIGHT: trim motion shall not occur.
Moving both halves simultaneously to each position, trim motion shall occur as shown by the YAW TRIM indicator.

Trim all axes for takeoff. Determine stabilizer takeoff setting by referring to Figure 4-2 on page 4-34.

CAUTION

Failure to set the correct trim for take-off may result in high rotation forces, delayed rotation and a substantial increase in take-off distance.

Verify the correct operation of the ice detector selecting the ICE DET position on the SYS TEST panel and pressing momentarily the central button: the ICE amber light located in the upper left side of the instrument panel will illuminate and, after a few seconds, will blink until the ICE lighted pushbutton is not pressed: then will extinguish.

To perform windshield heat test, select on the ANTI-ICE panel the WSHLD HTR PRI system to LO position: on the MFDI display an electrical load increment between 20 and 30 Amp. should be read; a similar behaviour occurs when the SEC system is selected to LO position: the increment should be between 25 ÷ 35 Amp. The higher values correspond to peak condition or to low ambient temperature, the lower to stabilized condition or high ambient temperature.

To perform the engine ice vane and the oil cooler intake heater test select, on the ANTI-ICE panel, the L/R ENG ICE VANE/OIL COOL INTK position and observe the corresponding green light on the annunciator panel which shall illuminate when the vane reaches the correct position after 30 seconds approximately and when the temperature of the oil cooler intake lip reaches the correct value: depending on the ambient conditions the power lever should be advanced between 82 and 86% N_G approximately.

Engine inlet de-ice boots correct operation is checked setting the BOOTS switch to TIMER position: the L E and R E green lights located on the ANTI-ICE panel should illuminate for 5 seconds to show the inflation cycle.

Depending on the ambient conditions the power levers should be advanced to Flight Idle or above.

WARNING

Do not operate engine inlet de-ice boots below –40°C. No takeoff authorized with frost, snow or ice adhering to propellers, windshields, powerplant installation and pitot/static ports, or with snow or ice adhering to the wings, vertical and horizontal stabilizer or control surfaces.

NOTE

Perform Main and Fwd wing anti ice tests if ice conditions are known or expected.

To perform the main wing anti-ice test set, on the ANTI-ICE panel, to AUTO position the L/R MAIN WING switches and on the SYS TEST panel the MN WG A/I mark: press momentarily the central test button.
Should the green light illuminate immediately after the pushbutton has been pressed, that would indicate a control valve failure.
After approximately 20 seconds both green L/R MN WG A/ICE lights shall illuminate on the annunciator panel.
A flashing green L/R MN WG A/ICE light indicates the failure of a temperature sensor which does not affect the proper operation of the system: however the flight is allowed due to the redundancy of the system. Have a maintenance check as soon as practical.
After the test switch OFF the main wing anti-ice system to exit the test mode (the control valve closes).

To perform the forward wing anti-ice system test, select L or R GEN position on the MFDI and the FWD WING ANTI-ICE mark on the SYS TEST panel, then turn ON the appropriate L/R FWD WING switch on the ANTI-ICE panel: depending on the ambient temperature, the L or R FD WG A/I green light could illuminate. This does not indicate that the system is working properl, but only that the skin temperature is in the normal operating range.
Press the test button momentarily and check on the MFDI an increase of power absorption of approximately 30 ÷ 40 Amp. for each de-ice system: do not wait for L or R FD WG A/I green light illuminated.

If the EFIS system is installed, perform the system test as explained in the Supplement 3 at Section 9 of this POH.

If the Autopilot system is installed, perform the system test as explained in the Supplement 1 at Section 9 of this POH.

If installed, the Radio Altimeter can be tested by pushing and holding the PUSH TEST switch on the digital indicator. The following sequence occurs:

- For the first two seconds, decision height to the nearest foot is displayed in the RAD ALT window and may be adjusted during this time.
- The system test altitude (50 feet) is displayed for the next two seconds.
- Lamp test (8888)is displayed after 4 seconds and until the PUSH TEST switch is released.

In order to detect a possible dormant failure in the cabin door monitoring circuit, it is necessary to repeat the annunciator panel test. Select the ANN LTS position on the SYS TEST panel and press the test button: check that the CAB DOOR red warning light is flashing.
Verify the CAB DOOR and the BAG DOOR lights not illuminated after releasing the test button.

4.3.5 TAXIING

While taxiing, apply brakes to determine their effectiveness. Avoid excessive brakes use to prevent overheating with possible tire deflation. Use beta range propeller setting, if required, for reducing running speed.

NOTE

Keep brakes warm during taxi operation in snow, slush and water conditions.

When running on a level surface, disengage the steering system and check the airplane has no tendency to yaw left or right: a deviation tendency may reveal an uncorrect brake release.
Reengage the steering system to the TAXI position.

Set the power levers at IDLE for a reverse check:
move the power levers toward REVERSE and observe N_G and N_P increase.

While taxiing with the power levers at IDLE, exercise the propeller controls moving the condition levers from MAX RPM to FEATHER to check the propeller controls and the response to the governor.

4.3.6 ENGINE RUN UP

Prior to engine run up, set the parking brake locked by pulling and turning the handle in vertical position.

To test the propeller overspeed governors, advance condition lever to MAX RPM and power lever to obtain 2000 RPM.

Select the momentarily PROP OVSP TEST switch alternatively to LEFT and RIGHT: observe a drop of approximately 150 RPM and a torque rise.
Release the switch to normal position and check that the propeller speed returns to 2000 RPM.
Check propeller governing to minimum RPM by retarding condition lever.

Proceed to autofeather system test: with the autofeather switch set to OFF position the amber AUTOFEATHER light must be illuminated: setting the switch to ARM position, the light must extinguish.
Advance both power levers to obtain approximately 750 FT.LB torque.

Set the autofeather switch to TEST position and hold: both L and R AUTOFEATHER green light on the annunciator panel should illuminate approximately after two seconds, indicating a fully armed system.

Retard power levers individually: between 680 LB.FT and 480 LB.FT torque, opposite light should extinguish and between 470 LB.FT and 290 LB.FT the light of the engine being retarded will flash as prop cycles through feather then, after TEST button release, should extinguish.

The difference between high torque pressure transducer and low torque pressure transducer values shall be at least of 70 FT.LB. This separation is required for both the individual engine and for the two engines together (i.e. LH high torque vs. RH low torque and vice versa).

Retard power levers simultaneously: both lights should extinguish, neither propeller feathers.

WARNING

If the autofeather system does not function in accordance with the pre-flight test procedure, takeoff is not authorized.

After the autofeather system test has been successfully completed, set the autofeather switch to ARM position and release the parking brake.

4.3.7 BEFORE TAKEOFF

Check that all circuit breakers are IN and set the anticollision lights to AIR.

Select windshield heat as required by weather condition and switch ON pitot, static ports and stall warning device.
Set the seat belts and no smoking sign ON.

The engine gauges, flight instrument and transponder should be checked and set.

NOTE

Possibility exists that signal returns become visible on the radar map as either three separated echoes at 10, 12 and 2 o'clock (flying over the sea surface) or a single "horse shoe" (flying over the ground), at a distance equivalent to the airplane altitude while looking for weather at short distance (25 NM and lower ranges) and tilt up. Intensity of the false echoes increases with the gain setting.

Be sure that all warning and caution lights are not illuminated.

Check ON the bleed air switches.

NOTE

When operating from high altitude airports with high OAT, it may be necessary to switch OFF both bleed air to reduce engine ITT.

Check if the fuel pumps are to MAIN.
Check condition levers are MAX RPM.
Check MID position for flaps.
Check longitudinal trim properly set for takeoff according to Fig. 4-2 (take off pitch trim vs. C. G.), aileron and rudder trim in NEUTRAL position.
Check flight controls for freedom of movement.
Steering should be positioned for TAKEOFF and oil cool switches set to OFF.
Switch on the navigation and the taxi/landing lights if conditions require.

If ice conditions are known, activate the ice protection systems following the procedure indicated in the OPERATION IN ICING CONDITIONS Paragraph.

4.3.8 TAKEOFF

Hold the brakes and advance power lever until about 2000 ft-lb torque.

WARNING

Before applying full power, be sure the condition levers are set to MAX RPM. Disattending this procedure, a remarkable increment of ground roll will result.

Check autofeather armed (green AUTOFEATHER lights illuminated), release brakes, increase power up to 2150 lb.ft. and check engine instruments.

NOTE

Torque limit of 2150 lb.ft. is the static value to be applied for takeoff in order to obtain the normal 2230 lb.ft. at takeoff speed for ram effect during the takeoff run.

WARNING

If ambient temperature is below –25°C, it is necessary to operate the main wing anti-ice and the engine ice vane systems before applying full power to ensure that the autofeather is armed.
When takeoff is completed and autofeather disengaged, the ice protection can be switched OFF.

At low ambient temperature (below – 25°C), in order to ensure that the autofeather is armed, it is necessary to select, on the ANTI ICE panel, AUTO position for L/R MAIN WING and L and R position for ENG ICE VANE/OIL COOL INTK switches.

When takeoff is completed and the autofeather system disengaged, the wing and engine anti ice systems can be switched OFF. As the aircraft accelerates, an increase in torque at a fixed power lever position is normal. Adjust power setting as required to maintain engine gauges within limits.
Disengage steering not over 60 KIAS. Before rotation attain a minimum airspeed as per Fig. 5-19.
Rotate approximately between 10° to 15° nose up according to the weight and, after lift off, accelerate to and maintain an airspeed of 120 KIAS until above 50 ft. Below 160 KIAS switch off the taxi/landing lights, if applicable, and check LTS DOOR OPEN green advisory light off.
Retract landing gear below 180 KIAS and flaps below 170 KIAS. Do not retract the landing gear prematurely.

Disengage the autofeather system above 150 KIAS.

4.3.9 CLIMB

Set climb power and maintain the climbing speed in accordance with the performance information presented in Section 5 of this AFM/POH. After takeoff, the seat belt and no smoking sign may be turned OFF as required. Check cabin pressurization.
Set the windshield heat control switches to the LO or, if necessary, the HI position.

4.3.10 CRUISE

Select cruise power and speed in accordance with the performance information presented in Section 5 of this AFM/POH.
Check the readings of the engine instruments and monitor fuel gauges during flight: if necessary use crossfeed. To operate in crossfeed, turn the CROSSFEED knob horizontal and then switch OFF the fuel pump of the engine located on the same side as the wing tank with less fuel quantity.
Check pressurization and set cabin comfort controls as desired.

4.3.11 DESCENT

Set the windshield heat as required.
Shortly after letdown is initiated turn the knob labeled A on the CABIN PRESS panel to read the pressure altitude of the landing field and, with the knob B set the QNH. PIP mark on knob R allows a cabin rate of not less than 300 ft/min. A higher setting should be selected for rapid descents so that the aircraft altitude does not catch up with cabin altitude.

4.3.12 BEFORE LANDING

Switch ON the seat belts and no smoking signs.
Set the condition levers to MAX RPM.
At speed below 180 KIAS, lower the landing gear and check for three green.
Extend flaps as required and check, at the end of the maneuver, the SYNC LIGHT OFF; the maximum speed for flaps extension is 170 KIAS for the MID position and 150 KIAS for full flap.
ARM autofeather below 150 KIAS. Switch ON landing light if required below 160 KIAS.

CAUTION

When operating in icing conditions, the landing procedure must be performed with flaps MID and the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 6 KIAS.

For more information about airplane operation in icing conditions consult para. 4.3.23 of this Section.

Autopilot and steering must be OFF for landing.

Compare cabin altitude with aircraft altitude. If necessary, depressurize cabin with the DUMP switch before landing; aircraft is not approved for landing when pressurized.

NOTE

Demonstrated crosswind component for landing is 25 KIAS.

4.3.13 LANDING

Prior to reaching 50 ft above landing surface verify that the gear and flaps are down.
Assume an approach speed as per Fig. 5-72 at Section 5.

CAUTION

When operating in icing conditions, the landing procedure must be performed with flaps MID and the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 6 KIAS.

Steering engagement during landing is prohibited.

The landing distance with flaps MID (Figure 5-76) must be increased approximately by 10% if reverse thrust is not applied or by 5% if reverse thrust is applied.
For more information about airplane operation in icing conditions consult para. 4.3.23 of this Section.

Use power as required and reduce during the flare, check condition lever for MAX RPM.
After touch down use brakes and reverse as required.
Engage reverse thrust below 1900 prop RPM, or 5% drop from the set value, and disengage when the speed has decreased to about 40 KIAS, in order to avoid damages to the propellers.

NOTE

When landing at aft C.G. initiate flaps retraction before actuating reverse power.

When landing at light weights, use caution when applying brakes, as excessive pedal pressure will result in skidding the tires with a resultant loss in braking effectiveness.

When landing is completed and reverse has been disengaged retard the condition levers to GROUND IDLE.
Engage Steering in TAKE OFF mode (if necessary).

4.3.14 BALKED LANDING

In a balked landing situation, apply takeoff power, maintain torque and engine temperature within allowable limits.
Maintain an airspeed of 115 KIAS.

CAUTION

When operating in icing conditions, the landing procedure must be performed with flaps MID.

The balked landing speed, in icing conditions, with flaps MID is 130 KIAS.
For more information about airplane operation in icing conditions consult para. 4.3.23 of this Section.
After climb is established, accelerate the airplane then retract the flaps to MID (below 150 KIAS), retract the landing gear, then retract flap to UP position (below 170 KIAS).
Accelerate to and maintain a speed of 160 KIAS.

4.3.15 AFTER LANDING

When clear of active runway, set the power levers to IDLE and, if necessary, select the steering to TAXI.
Retract the flap.
Turn the radar equipment OFF as well as the transponder and ice protection equipments (if applicable).
Anticollision light should be turned to GROUND and the taxi light should be switched on if required.
Switch OFF the autofeather.
Verify cabin altitude equals landing field elevation.

In the event of landing with severe brake use an adequate brakes cooling time is required before a successive takeoff.

4.3.16 SHUTDOWN

After the airplane is taxied to a stop, set the parking brakes: they should not be set if they are very hot or if the ambient temperature is below freezing and the brakes are wet.
Switch off avionic and all electrical equipment as well as bleed air.

CAUTION

Failure to select avionics power switches to the OFF position during the engine shutdown may result in equipment failure.

Check power levers at IDLE and condition levers at GROUND IDLE.

NOTE

Allow the engine to stabilize for a minimum of one minute at minimum obtainable ITT.

During the shutdown ensure that the compressor decelerates freely.

Switch OFF the hydraulic pump and pull the condition levers to CUT OFF.
Set fuel pump and battery switches to OFF.

WARNING

If there is an evidence of fire within the engine after shutdown, proceed immediately as described under ENGINE DRY RUN Procedure.

CAUTION

The passenger door may be opened 10 seconds after the passenger upper door handle has been rotated to OPEN position.

Rotate the upper door handle to OPEN position, wait that the door seal has deflated (about 10 seconds, i.e. until external/internal background passes through the frame/door gap), push/pull the upper door open and relocate the handle to STOW position. Pull the safety pin from the lower handle and rotate the handle to OPEN position. Pull and hold firmly the cable handle knob, then lower gently the lower door.

4.3.17 AFTER SHUTDOWN

The engine oil level must be checked daily. Refer to Section 8 of this AFM/POH for checking procedure.

NOTE

Perform the engine oil level check within 10 minutes after engine shutdown.

After the last flight of the day, the propellers blades must be cleaned to remove engine exhaust residue. Use a rag dampened with Stoddard solvent or jet fuel to wipe down each propeller blade.

If there is visual evidence of corrosion or bare metal exposed as a result of paint erosion, then repair at the next scheduled inspection is recommended.

Before leaving the airplane, install the control locks, lock the emergency exit by installing the handle lock pin (S.N. 1034 and up airplanes), place the wheel chocks, install the covers on the pitot tubes, engine and oil cooler intakes and exaust ducts.

NOTE

Do not install covers on a warm engine.

Attach propeller restrainers to prevent windmilling and, if necessary, install tie-down ropes (for more information refer to Section 8 of this AFM/POH).

NOTE

If the airplane is supposed to be parked for more than 2 days unplug the battery clamp from the battery in the baggage compartment.

4.3.18 V_{SSE} - INTENTIONAL ONE ENGINE INOPERATIVE SPEED

V_{SSE} is a speed selected by the aircraft manufacturer for training pilots in the handling of multi-engine aircraft. It is the minimum speed for intentionally rendering one engine inoperative in flight. This speed provides the margin the manufacturer recommends for use when intentionally performing engine inoperative maneuvers during training

Condition levers are to be set to MAX RPM and the power lever of the simulated inoperative engine near the IDLE position: this setting approximate zero thrust at low altitude and at V_{SSE} speed.

The intentional one engine inoperative speed, V_{SSE}, is 140 KIAS.

4.3.19 V_{MCA} - AIR MINIMUM CONTROL SPEED

V_{MCA} is the minimum flight speed at which a twin-engine airplane is directionally controllable as determined in accordance with the RAI/FAA Certification Regulations. Airplane certification conditions include one engine inoperative and propeller windmilling; not more than a 5° bank toward the operative engine; landing gear up; flaps in takeoff position and most rearward center of gravity.

V_{MCA} has been determined to be 100 KIAS with the propeller feathered and 128 KIAS with propeller windmilling.
The demonstration and all intentional one engine operations shall be performed at a safe altitude of at least 7000 feet above the ground in clear air only.
The recommended procedure for V_{MCA} demonstration is to reduce the power approximately to idle and set the condition lever to MAX RPM on the simulated inoperative engine at or above the intentional one engine inoperative speed, V_{SSE}.
Slow down at a rate of approximately one knot per second until the V_{MCA}, or stall warning is obtained.

CAUTION

Use rudder to maintain directional control and ailerons to maintain 5° bank toward the operative engine. At the first sign of either V_{MCA} (inability to maintain heading or lateral attitude) or stall warning (aerodynamic stall buffet or stall warning horn sound) immediately initiate recovery: reduce power to idle on the operative engine and lower the nose to regain airspeed.

As recovery ability is gained with practice, the starting speed may be lowered in small increments until the feel of the airplane in emergency condition is well known. It should be noted that as the speed is reduced, directional control becomes more difficult.

Under no circumstances should a V_{MCA} demonstration be attempted at a speed lower than 128 KIAS with propeller windmilling or 100 KIAS with propeller feathered.

4.3.20 STALL CHARACTERISTICS

Power off stall in all configurations, weights and centers of gravity are characterized by the reaching of minimum speed with full back control, before an aerodynamic stall with slight pitch down developing; a moderate buffet develops about 15 kts above stalling speed in clean configuration, and 10 kts above stall speed for T.O. and landing configurations.
At minimum speed full aircraft control on all axes can be maintained, and recovery can be performed releasing nose up pull on longitudinal control.

Altitude loss is no more than 1000 ft for a normal recovery with power application when 1.2 V_S is reached.

Immediate power application is possible, allowing a reduction of altitude loss.

Power on stalls are characterized by extreme nose high pitch attitudes (over 30°) but handling is in other respects similar to the power off condition.
Stall is again defined by a minimum speed condition with full back longitudinal control, with the aircraft fully controllable on all 3 axes, and recovery can be promptly obtained by a release of control pull.

Altitude loss can be contained to no more than 500 ft with a normal recovery action.

Single engine stalls are characterized by the same warning of two engine stalls.
Full control of the aircraft can be acheived without reducing power on the operative engine.

Altitude loss is no more than 600 ft.

4.3.21 ROUGH AIR OPERATION

The Rough Air Penetration Speed has been selected in order to reduce the stresses to which the airplane is subjected by turbulent air, still providing a safe airspeed margin above stalling as a result of turbulence.
In condition of extreme turbulence, slow the airplane to Rough Air Penetration Speed of 195 KIAS at or below 25000 ft.
At higher altitudes decrease this speed 5 KIAS for each 5000 ft above 25000 ft.
A linear variation may be used for altitudes between 25000 ft and 41000 ft.

Fly attitude (do not change trim) and avoid abrupt maneuvers.
Turn ON the FASTEN SEAT BELT sign as a precaution against buffeting and lurching.

4.3.22 OXYGEN SYSTEM

Should the need arise for oxygen to be employed, the pilot and copilot masks are stowed in a recess on the left and right side of oxygen panel and the passenger masks are stored in the overhead panels. The crew need only to don their masks to start breathing oxygen. As required, the crew can select normal (N) (diluted oxygen) or 100% oxygen on the mask-mounted regulator. The presence of the green pellet in the flow indicator on each mask hose indicates that oxygen is flowing through the mask.
When the cabin altitude exceeds approximately 14,000 feet, the passenger oxygen masks will automatically deploy from the overhead panels when the selector on the left side panel is set to AUTO NORMAL position. The passengers must PULL the lanyards attached to their masks to start the flow of oxygen. Inflation of the small green compartment built into the oxygen accumulator bag on the passenger masks indicates oxygen flow.
Occupants should don the masks, checking the flow indicator frequently. The pilot should monitor the oxygen pressure gauge to determine oxygen supply and consumption.
Passenger masks may be manually deployed by the pilot at any time by selecting the MANUAL MASK RELEASE position.

WARNING

Certain petroleum base substances (mustache wax, lipstick, etc.) are combustible in the presence of 100% oxygen. Donning mask set at 100% oxygen could cause burns to areas where petroleum base substances have been applied.

If the 40 cu. ft. oxygen cylinder has a pressure of 1850 psi at 70°F (21°C) when the use of oxygen is begun, oxygen will be available as listed in Figure 4-3.
In Table 1 and 2, the duration has been calculated with the 1850 psig cylinder (charged) discharging to 250 psig (empty) considering that the occupantsmasks'are in operation at the different cabin altitudes.
The cylinder pressure read on the cockpit gauge indicates that there is still a 10 minutes oxygen duration before the cylinder is fully empty.
The following table 3 shows the oxygen duration for flight over 35000 ft. with a single pilot at the aircraft controls (FAR 91 requirements).
In this case only one crew mask is in operation. An oxygen reserve of ten minutes duration has been considered.
The cylinder pressure is the pressure read on the cockpit gauge assuring the above reserve necessary to descend from flight altitude to 12500 ft. with different number of passengers. Passenger masks are in operation only during the descent.

TABLE 1

FAR 91 REQUIREMENTS

CREW : 1

CABIN ALTITUDE (FT.)		NUMBER OF PASSENGER									
		0	1	2	3	4	5	6	7	8	9
15000	DURATION	384	102	59	41	32	26	22	19	16	15
	CYL. PRES	295	410	525	640	755	870	980	1090	1212	1325
25000	DURATION	195	83	52	38	30	25	21	18	16	15
	CYL. PRES	335	450	560	670	780	890	1000	1110	1220	1335
35000	DURATION	297	99	60	43	33	27	23	20	17	16
	CYL. PRES	310	412	520	630	735	840	950	1055	1160	1270
40000	DURATION	417	111	64	45	35	28	24	21	18	16
	CYL. PRES	290	400	500	610	715	815	920	1028	1130	1240

TABLE 2

CREW : 2

CABIN ALTITUDE (FT.)		NUMBER OF PASSENGER									
		0	1	2	3	4	5	6	7	8	9
15000	DURATION	192	81	51	37	29	24	21	18	16	14
	CYL. PRES	335	450	565	680	795	910	1025	1240	1255	1370
25000	DURATION	97	58	41	32	26	22	19	17	15	14
	CYL. PRES	415	525	640	750	860	972	1080	1195	1300	1415
35000	DURATION	148	74	50	37	30	25	21	19	16	15
	CYL. PRES	360	470	575	680	790	895	1000	1108	1215	1330
40000	DURATION	208	88	56	41	32	26	22	20	17	16
	CYL. PRES	330	430	540	645	750	855	960	1065	1170	1275

* DURATION (min.): 1850 psig. charged cylinder discharging to 250 psig. at 70 F.

* CYL PRESS (psi): pressure required to have an oxygen sypply of 10 minutes duration.

(cont'd)

TABLE 3

OXYGEN DURATION FOR FLIGHT OVER 35000 FT.

PRESSURIZED CABIN

SINGLE PILOT

ONE CREW MASK DISPENSING		
NUMBER OF PASSENGERS	OXYGEN DURATION Minutes	CYL. PRESS. FOR 10 MIN.
0	323	300
1	300	415
2	276	530
3	251	645
4	228	760
5	204	875
6	180	985
7	156	1100
8	132	1215
9	108	1330

* DURATION (min.): calculated considering a supplemental oxygen reserve of 10 minutes.

* CYL PRESS (psi): pressure assuring an oxygen reserve of 10 min.

Figure 4-3. OXYGEN DURATION

NOTE

Crew oxygen durations are based on NORMAL (N) oxygen setting on mask-mounted regulator.

4.3.23 OPERATION IN ICING CONDITIONS

If icing conditions are encountered (amber ICE caution light illuminated for 5 seconds), set to L and R position the ENG ICE VANE/OIL COOLER INTK switches and to AUTO position the BOOTS DE ICE switch.
After approximately 30 seconds the L and R ENG/OIL A/I green lights on the annunciator panel will illuminate and an engine torque drop will be observed; after few minutes from the actuation, depending on the severity of the ice encounters, the L E and R E green lights on the ANTI-ICE panel will illuminate during the inflation cycle.

WARNING

Do not operate the engine de-ice boots below – 40°C.

NOTE

The surface ice protection systems must be activated approximately 30 seconds after the actuation of engine ice protection systems to avoid a quick increase of engine ITT.

Set the L and R MAIN WING switches to the AUTO position: the green L and R MN WG A/ICE lights on the annunciator panel will illuminate approximately 30 seconds after the actuation: an engine torque drop is normal.

CAUTION

The MANUAL mode of operation of the main wing anti-ice system must be selected only in case of failure of the AUTO mode to avoid a possible leading edge skin overtemperature.

Set the FWD WING switches to L and R positions and operate the windshield heater. Check that both WSHLD HEAT PRI and SEC switches are set to the LO position or move to the HI position if the heating is inadequate.

Maintain the propeller speed (N_P) at 2000 RPM.

Correct operation of the surfaces and engines anti-ice systems can be checked observing the corresponding green advisory light illuminated on the annunciator panel.

NOTE

1. During descent, or in cruise at low power settings and/or low ambient temperatures, the L/R MN WG A/ICE and the L/R ENG OIL A/I lights may extinguish, indicating that the temperature of the heating air is below the reference value.
2. During cruise at 25000 feet or higher altitudes and low power settings, the cabin altitude may increase.

In both cases an increase of power may restore the normal conditions.

The P-180 AVANTI airplane is certified for flight in the icing conditions defined by the Appendix "C" to FAR 25. Neverthless, icing conditions exceeding the capabilities of the anti-icing and de-icing systems (defined as "severe" by the Aviation Weather Services) may be encountered. For this reason, the pilot should avoid such severe ice conditions and should exit the icing cloud if an abnormal accretion rate is recognized (visually or by means of the ice detector).

In addition, as freezing rain conditions have not been tested but only evaluated by analysis, freezing rain encounters should be avoided and, in any case, flight in these conditions should be limited to short periods of time.

Some handling and performance changes can be experienced with ice build up on unprotected parts and run-back ice on forward and main wings.
The most noticeable characteristics are a mild continuous airframe buffet and a significant increase in power required to maintain a specific cruise speed.

Stall speeds should increase with ice accumulation: with an ice build-up corresponding to sustained ice accretion (3 inches approximately on the main wing tips), the increment will be approximately 6% for all flap setting: however stall warning margins remain adequate.

The power loss associated with the operation of the ice protection systems depends on speed, altitude and temperature and could reach 20% approximately: however the pilot may reset the power without exceeding the ITT (red line) or torque limits.

Climb performance.

If the power cannot be reset and if the ice accretion on the unprotected parts corresponds to one inch approximately on the main wing tips, the following may result:

a. the normal two engines rate of climb (Fig. 5-29) will be reduced by 800 ft/min. at sea level and 1800 ft/min. at 20000 feet and the ceiling will be approximately 27000 feet.
b. the normal single engine rate of climb (Fig. 5-35) will be reduced by 500 ft/min. at sea level and 700 ft/min. at 10000 feet and the ceiling will be approximately 11200 feet.

Landing performance.

WARNING

The icing limitation requiring flaps in MID position for landing is necessary since landing with flaps DN, with heavy residual ice accumulation, may result in a decrease of longitudinal stability or limited trim capability if the C.G. position is, respectively, fully aft or forward.

The balked landing climbing speed, with flaps in MID position is 130 KIAS: if the power cannot be reset and if the ice accretion on the unprotected parts corresponds to three inches approximately on the main wing tips, the balked landing rate of climb with flaps in MID position (Fig. 5-75) will be reduced by 900 ft/min. maximum.

The approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 6 KIAS. The landing distance with flaps in MID position will be increased approximately by 10%.

NOTE

For other information on performance in icing conditions consult the Section 5 (Performance) of this POH.

4.3.24 COLD WEATHER OPERATION

NOTE

- Operation of the airplane has been demonstrated after prolonged exposure to a ground ambient temperature of –30°C (with takeoff at –24°C): this was the minimum value achieved during cold weather testing, and is not considered limiting.
- Other information related to cold weather operation are reported under "Operation on Contaminated Runways". paragraph which follows.

PREFLIGHT

Check the brakes and tires to the ground contact for freeze lock-up. Anti-ice solutions may be used on the brakes or tires if freeze-up occurs. No anti-ice solution which contains a lubricant, such as oil, should be used on the brakes. It will decrease the effectiveness of the brake friction areas.

In addition to the normal preflight exterior inspection, special attention should be given to all vents, openings, control surfaces, hinge points, and wing, tail, and fuselage surfaces for accumulation of ice or snow. Removal of these accumulations is necessary prior to takeoff. Snow and ice on an airplane will seriously affect its performance. The wing contour may be sufficiently altered by the ice and snow that its lift qualities are seriously impaired. Snow may be removed with a soft brush or mop. Chipping or mechanical removal of frozen deposits is not recommended. The use of glycol based deicing fluids is recommended. Material conforming to MIL-A-8243, Anti-Icing and Deicing-Defrosting Fluids, are acceptable.
More information about the use of these fluids can be found in the Chapter 12 of the P-180 AVANTI Maintenance Manual.

Inspect the propeller blades and hubs for ice and snow: the propellers should be turned by hand, in the direction of normal rotation, to be sure they are free to rotate prior to starting the engines.

Operation of some equipments installed in the cockpit (as, for example, digital data instrumentation, stall warning computer, etc.) may be sluggish at very low temperature (typically after a cold soak).
For this reason, it is recommended to perform the various preflight tests and checks, and to takeoff after approximately fifteen minutes from the environmental control system actuation.

NOTE

Even if the battery installed in the airplane (nickel-cadmium, sintered plate type) gives excellent performance over a wide temperature range, in order to prevent a heavy discharge and to increase the battery life time, it is recommended to use a ground power unit, to start the engines, if the ambient temperature is lower than –15°C.

To facilitate the engine start, at 13% N_G advance the condition lever to the flight idle position, as long as necessary, monitoring the ITT during engine run up.

NOTE

During the engine start, the oil pressure may increase at a rate slower than normal.

After engine start, exercise the propellers through low and high pitch, beta range, ground fine range, and into reverse range to flush any congealed oil through the system.

TAKEOFF

WARNING

If ambient temperature is below –25°C it is necessary to operate the main wing anti-ice and the engine ice vane systems before applying full power to ensure that the autofeather is armed. When the takeoff is completed and the autofeather disengaged, the ice protection can be switched off.

The micro switch which enables the operation of the autofeather, has a fixed position relative to the power lever, and, for the same lever setting, the power delivered by the engine is much more at low temperature that at high temperature.
For this reason, during takeoff at low temperature, it will be necessary to operate the main wing anti-ice and the engine ice vane systems to be sure that the autofeather is armed.

If encountering any visible moisture during takeoff, the engine anti-ice should be turned on to preclude the possibility of ice going into the engine air inlet.

AFTER SHUTDOWN

If the airplane is expected to be soaked at temperatures below freezing remove water and other freezable liquids from the airplane.

4.3.25 OPERATION ON CONTAMINATED RUNWAYS

NOTE

The level of safety is decreased when operating on contaminated runways and therefore every effort should be made to ensure that the runway surface is cleared of any significant precipitation.

The provision of information for contaminated runways should not be taken as implying that ground handling characteristics on these surface will be as good as can be achieved on dry runways, in particular, in cross wind and when using reverse thrust.

Certification splash tests, performed in a 50 m long, 25 m wide water bed with a water level variable up to 30 mm, have shown that droplets trajectory of the water did not affect the engines air inlets neither their operating characteristics; water spray pattern neither affected the accuracy of the airspeed system. Analysis has shown that for density of precipitations less than one (slush, wet snow, dry snow), the spray pattern generated from forward wheels, is not critical.

TAXIING

When possible, taxiing in deep snow, slush or water should be avoided.
Under these conditions the contamination can be forced into the brake assemblies.
Keep the flaps retracted during taxiing, to avoid throwing water, snow or slush into the flap mechanisms and to minimize damage to the flap surfaces, until line-up for takeoff.

If ground ambient temperature is low, keep the brakes warm during taxi operation, proceed slowly and allow more clearance in maneuvering the airplane, since spotty ice cover is difficult to see. Directional control is achieved using the steering wheel and differential thrust.

Applying nose-down elevator while taxiing on iced surfaces may be helpful. This loads the nose wheels and increases directional control stability.
Turns must be made at reduced speed.

NOTE

Engine run up test performed on iced runways may cause the airplane to slip.

TAKEOFF

Before the takeoff, ensure the runway is free from hazards, such as snow drifts, glazed ice and ruts. Verify the current conditions of entire runway as closely as possible to the planned departure time. Depth of standing water, slush or snow should be measured in a sufficient number of places to be representative of the entire length of runway required, particularily at the high speed of takeoff roll.

Make a special point of being sure parking brake is released before starting takeoff on an icy or snow covered runway.

A moderate nose-up elevator during the takeoff ground run on contaminated runways, decreases the load on nose wheels improving the takeoff performance.

If flight conditions permit, leave the landing gear extended (without braking the wheels) for a short time after takeoff to remove most of the moisture, snow or slush.

LANDING

Braking and steering are less effective on contaminated and/or slippery runways. Also hydroplaning may occur on contaminated runways. Use of the rudder to maintain directional control until the tires make solid contact with the runway surface may be necessary.

Prior to reaching 50 ft. above landing surface:

1. Landing gear - CHECK DN (3 green lights)
2. Flaps - CHECK DN

CAUTION

When operating in icing conditions, the landing procedure must be performed with flaps MID and the approach speed, as compared with the flaps MID approach speed (Fig. 5-76), must be increased by 6 KIAS.

3. Approach speed - REFER to Section 5 of this Manual Fig. 5-72
4. Power - AS REQUIRED
5. Condition levers - CHECK MAX RPM

After touchdown:

6. Brakes - AS REQUIRED

CAUTION

Improper use of brakes at high speed and low airplane weight on wheels may cause wheel stoppage particularly on low friction runway. Use brakes at low speed if possible.

7. Reverse - Below 1900 prop RPM, or 5% drop from set value, slowly move the power levers approximately 3/4 in. back from the idle detent into the beta range; apply further reverse thrust only if required

CAUTION

Asymmetrical reverse thrust may be difficult to control on a slippery runway.

NOTE

When landing at aft C.G. initiate flaps retraction before actuating reverse power.

8. Reverse - AVOID USE below 40 KIAS, approximately.

At landing completed:

9. Condition levers - GROUND IDLE
10. Steering - ENGAGE TAKE OFF (if necessary)

When parking the airplane, parking brake should not be set immediately, if not necessary: chocks or sandbags can be used to prevent the airplane from rolling.

4.3.26 EXTERNAL NOISE REDUCTION PROCEDURES

NOTE

The certificated noise levels of Section 2 (para. 2.22) have been determined using normal procedures.

Do not apply the External Noise Reduction procedure where it would conflict with safety or Air Traffic Control clearances or instructions and in icing conditions.

Increased emphasis on improving the quality of our environment requires renewed effort on the part of all pilots to minimize the effect of airplane noise on the public.

A pilot can demonstrate concern for environmental improvement by application of the procedure defined below.

Approach to and departure from an airport should be made so as to avoid prolonged flight at low altitude near noise sensitive areas.

Because the P-180 airplane external noise is higher at higher propellers RPM and with the flaps in full down position, the following procedures are suggested to reduce external noise:

TAKEOFF

1. Perform the normal takeoff
2. Flaps - UP as soon as practical
3. Power - Reduce as practical (torque below 2000 lb.ft)
4. Condition levers - 1800 RPM (Check maximum torque 2230 lb.ft.)

NOTE

With the condition lever to 1800 RPM, the two engines rate of climb (Fig. 5-29) will be reduced by 18% maximum when the power available is torque limited.

BEFORE LANDING

1. Seat belts and no smoking signs - ON
2. Condition levers - 1800 RPM
3. Landing Gear (below 180 KIAS) - DN; CHECK 3 GREEN
4. Flaps (below 170 KIAS) - MID
5. Autofeather (below 150 KIAS) - ARM; CHECK LIGHT
6. Landing lights (below 160 KIAS) - AS REQUIRED
7. Autopilot/Steering - OFF
8. Cabin pressure barometric condition - CHECK

LANDING

Prior to reaching 50 feet above landing surface:

1. Landing Gear - CHECK DN (3 green lights)
2. Flaps - CHECK MID
3. Approach speed - Refer to Fig. 5-76 at Section 5 of this Manual
4. Condition levers - CHECK 1800 RPM

CAUTION

If max power is required (balked landing, single engine, etc.) advance the condition levers forward to 2000 RPM then the power levers to max torque or ITT.

After touchdown:

5. Brakes - AS REQUIRED
6. Reverse - AS REQUIRED engage reverse below 1700 propeller RPM, or 5% drop from the set value
7. Reverse - AVOID USE below 40 KIAS, approximately

At landing completed:

8. Condition levers - GROUND IDLE
9. Steering - ENGAGE TAKE OFF (if necessary)

NOTE

With the condition levers to 1800 RPM the flaps MID landing distance (Fig. 5-76) must be increased approximately by 20% at 10945 lbs., 30% at 8500 lbs.

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SECTION 5

PERFORMANCE

5.0 GENERAL

This section provides all of the required (RAI and FAA regulations) and complementary performance information applicable to the airplane.

5.1 INTRODUCTION TO PERFORMANCE AND FLIGHT PLANNING

The performance information in this section is based on calculations and design data.
Effects of conditions not considered on the charts must be evaluated by the pilot.
Tabulated performance information is presented in increments of temperature, altitude and any other variables involved. To obtain exact performance values from tables, it is necessary to linearly interpolate between the incremental values.
The information provided in "Flight Planning Example" paragraph outlines a detailed flight plan using the performance charts in this section. Each chart includes its own example to show how it is used.

5.1.1 FLIGHT PLANNING EXAMPLE

The following Flight Planning Example illustrates the correct utilization of pertinent data presented in this section.

a. Associated Conditions

Basic information such as departure and destination airport conditions, enroute conditions, basic airplane conditions and factors such as weather, status of the runway, distance of the flight, number of passengers, etc., are known when planning a flight. Assume, for example, the following conditions:

1. Departure Airport Conditions

Outside Air Temperature	19°C
Pressure Altitude	3000 ft.
Wind and Direction	20 kts and 120°
Runway Direction	170°

2. Cruise Conditions

Outside Air Temperature	-44°C
Pressure Altitude	35,000 ft.
Enroute Distance	800 naut. mi.
Power Setting	Maximum Cruise (2000 RPM)

3. Destination Airport Conditions

Outside Air Temperature	17°C
Pressure Altitude	4000 ft.
Wind and Direction	13 kts and 80°
Runway Direction	120°

4. Airplane Configuration

Basic Weight (Assumed)	7370 lbs.
Fuel Tanks	330 gal.
Occupants	5 at 170 lbs. each
Baggage	200 lbs.

b. Airplane Loading

Use the information given in Section 6 (Weight and Balance) of this handbook to determine the airplane weight and center of gravity.

After proper utilization of the information provided, assume the following weights have been determined for consideration in the Flight Planning Example:

1.	Basic Weight	7370 lbs.
2.	Occupants(5 at 170 lbs. each)	850 lbs.
3.	Baggage	200 lbs.
4.	Fuel(303 gal at 6.7 lbs./gal.)	2030 lbs.
5.	Ramp Weight (total of above)	10450 lbs.
6.	Landing Weight (Takeoff Weight minus Total Fuel Required)	9117 lbs.

The landing weight cannot be determined until the weight of the fuel to be used has been established.

Check the ramp weight is below the approved maximum. Determine that weight and balance calculations have shown the C.G. position to be within the approved limits.

c. Takeoff

Distance Conditions of the departure airport and takeoff weight should be applied to the appropriate Takeoff Distance graph to determine the length of runway necessary. Takeoff conditions for the Flight Planning Example are listed below:

1.	Wind	20 kts
2.	Angle between Flight Path and Wind	50°
3.	Head Wind Component (from Wind Component Graph)	13 kts
4.	Outside Air Temperature	19°C
5.	Pressure Altitude	3000 ft.
6.	Takeoff Weight (Ramp Weight – Fuel for Taxi) (10450 – 50)	10400 lbs.

Using the Normal Takeoff over 50 feet graph the takeoff distances are as follows:

1.	Total Distance	2910 ft.
2.	Ground Run	1970 ft.

d. Climb

Entering the example conditions of the departure airport and the cruise altitude into the Time, Fuel and Distance to Climb graph yields the following:

1.	Time to Climb	17 minutes
2.	Fuel to Climb	208 lbs.
3.	Distance to Climb	66 naut. mi.

NOTE

The effect of winds aloft must be considered by the pilot when computing climb, cruise, and descent performance.

e. Descent

Entering the cruise and destination airport conditions into the Time, Fuel and Distance to Descend graph yields the following:

1.	Rate of Descent	3000 FPM
2.	Time to Descend	11 minutes
3.	Fuel to Descend	67 lbs.
4.	Distance to Descend	58 naut. mi.

f. Cruise

The total cruise distance can be obtained by subtracting the previously calculated distance to climb and distance to descend from the total enroute distance. For example:

Cruise Distance

= Enroute Distance – Climb Distance – Descent Distance

= 800 – 66 – 58

= 676 nautical miles

From Pressure Altitude vs OAT Chart and Power Setting Table for Maximum Cruise (2000 RPM, ISA +10° C) the cruise airspeeds are 358 knots at 10000 lbs. and 364 knots at 9000 lbs. Extrapolating these values for 9700 lbs. (estimated average cruise weight), the cruise speed is 360 knots.

From the same table, Fuel Flow is 536 lbs./hr. (total)

Cruise time and fuel may be calculated as follows:

Cruise Time

= Cruise Distance/Cruise Speed

= 676/360

= 1.88 hours or 113 minutes

Cruise Fuel

= Fuel Flow x Cruise Time

= 536 x 1.88

= 1008 lbs.

The above data can be used to verify the estimated average cruise weight as follows:

Average Cruise Weight

$$= \text{Ramp Weight} - (\text{Fuel for Taxi and Takeoff} + \text{Climb Fuel}) - \frac{\text{Cruise Fuel}}{2}$$

$$= 10450 - (50 + 208) - \frac{1008}{2}$$

= 9688 lbs.

From the Power Setting Table, the cruise speed is 360 knots for 9688 lbs.
Applying the above cruise time and cruise fuel formula results in the following figures:

Cruise Time

= 1.88 hours or 113 minutes

Cruise Fuel

= 536 x 1.88

= 1008 lbs.

g. Total Flight Time

The total flight time is determined by adding the time to climb, cruise time, and time to descend. The following flight time is required for this Flight Planning Example:

Total Flight Time

= Time to Climb + Cruise Time + Time to Descend

= 17 + 113 + 11

= 141 minutes

h. Total Fuel Required

The total fuel required can be determined by adding fuel for taxi and takeoff, fuel to climb, cruise fuel, and fuel to descend. The determined total fuel in pounds, divided by 6.7 will give the total fuel in gallons to be used for the flight.

Total Fuel Required

= Fuel for taxi and takeoff + Fuel to climb + Cruise fuel + Fuel to descend

= 50 + 208 + 1008 + 67

= 1333 lbs. (200 gallons)

i. Landing Distance

Subtracting the total fuel required from the takeoff weight of the airplane gives the landing weight:

Landing Weight

= Ramp Weight – Total Fuel Required

= 10450 – 1333

= 9117 lbs.

Destination airport conditions applied to the Wind Component graph gives the following head wind component for the Flight Planning Example:

The angle between the flight path and wind is 120° – 80° = 40°.

Therefore, the Head Wind Component is 10 knots.

From the Landing Distance over 50 Feet (with Reversing) graph with the destination airport conditions, the distances required for landing for the Flight Planning Example are as follows:

(1) Total Distance	2435 ft.
(2) Total Roll	1425 ft.

5.2 EFFECT OF BOUNDARY LAYER DEGRADATION ON PERFORMANCE

This airplane is characterized by extensive natural laminar flow over the forward and main wings.
Insect debris, dirt in general or rain, may force the boundary layer to become turbulent prematurely and the performances are affected by the loss of laminar flow.

The extension of laminar flow as function of the surface contamination is very difficult to determine; however, loss of performance, substantiated by flight test data, relative to the condition of fully turbulent flow from five percent of the chord, are indicated, if significant, in each performance graph or table contained in this section.

5.3 PERFORMANCE GRAPHS

5.3.1 HOW TO USE THE GRAPHS

1. A reference line indicates where to begin following the guidelines. Always project to the reference line first, then follow the guidelines to the next known item by maintaining the same PROPORTIONAL DISTANCE between the guideline above and guideline below the projected line. For instance, if the projected line intersects the reference line in the ratio of 30% down/70% up between the guidelines, then maintain this same 30%/70% relationship between the guidelines all the way to the next known item or answer.

2. The associated conditions define the specific conditions from which performance parameters have been determined. They are not intended to be used as instructions; however, performance values determined from charts can only be achieved if the specified conditions exist.

3. Notes have been provided to approximate performance with the anti-ice systems on and no ice accretion on the unprotected parts. The effect will vary, depending upon airspeed, temperature and altitude. At lower altitudes, where operation on the torque limit is possible, the effect of turning the anti-ice systems on will be less, depending upon how much power can be recovered without exceeding the ITT or torque limits.

4. The takeoff and landing performance contained in this Section was obtained using the procedures outlined in Section 4 of this Pilot's Operating Handbook. The takeoff and accelerate-stop graphs are based on the power value obtained from the associated TAKEOFF POWER graph. Torque was allowed to increase with increasing airspeed.

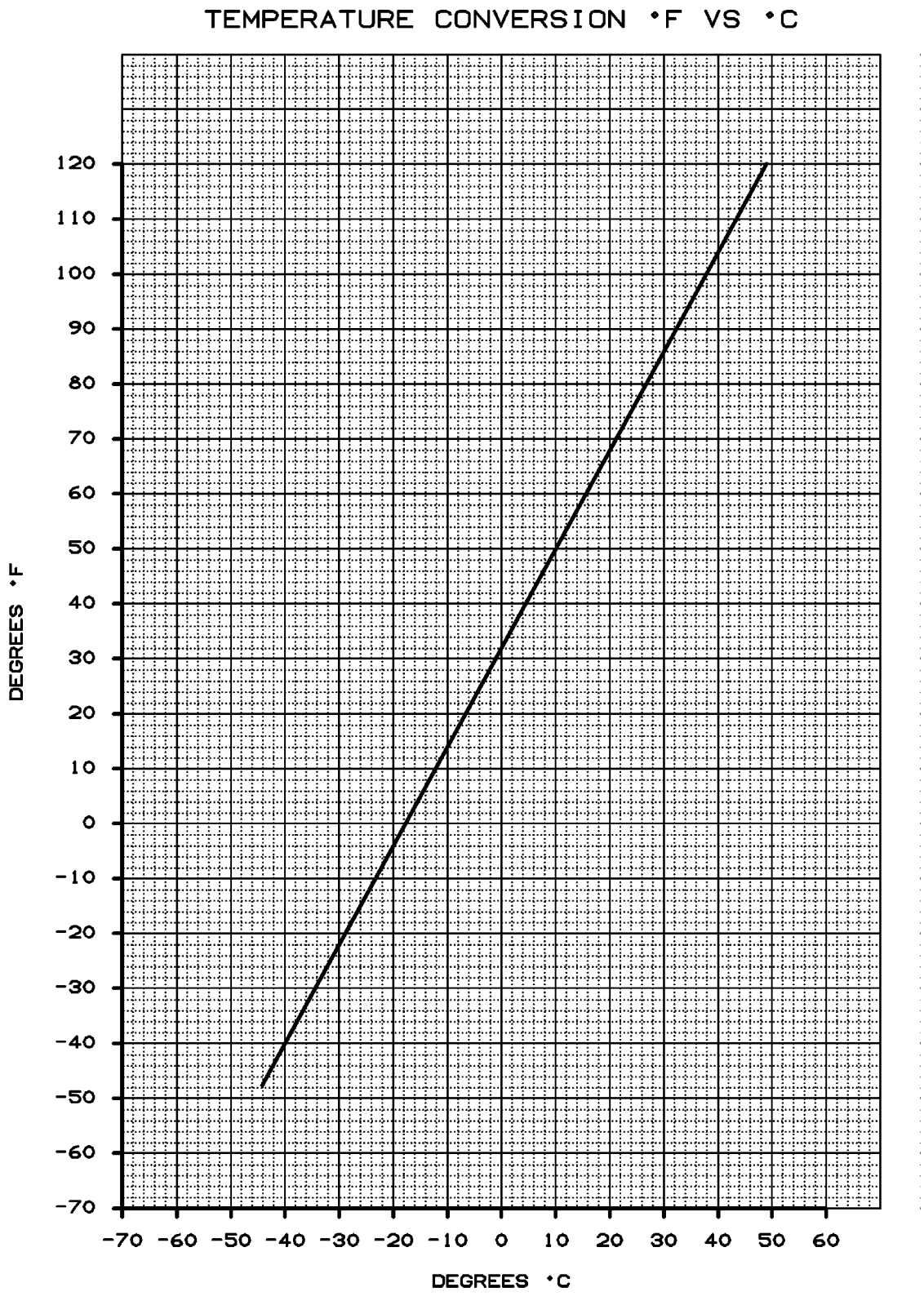


Figure 5-1. TEMPERATURE CONVERSION

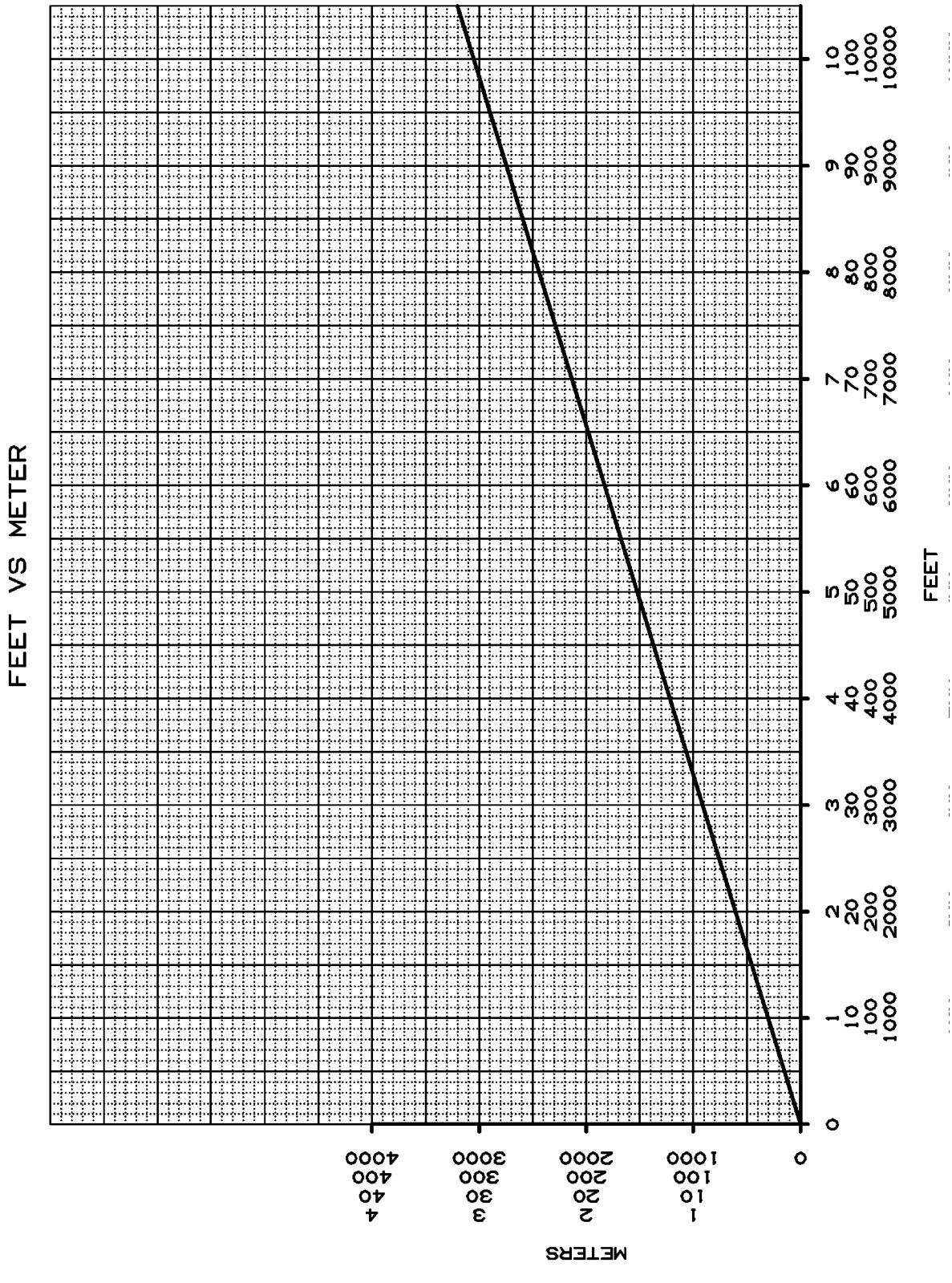
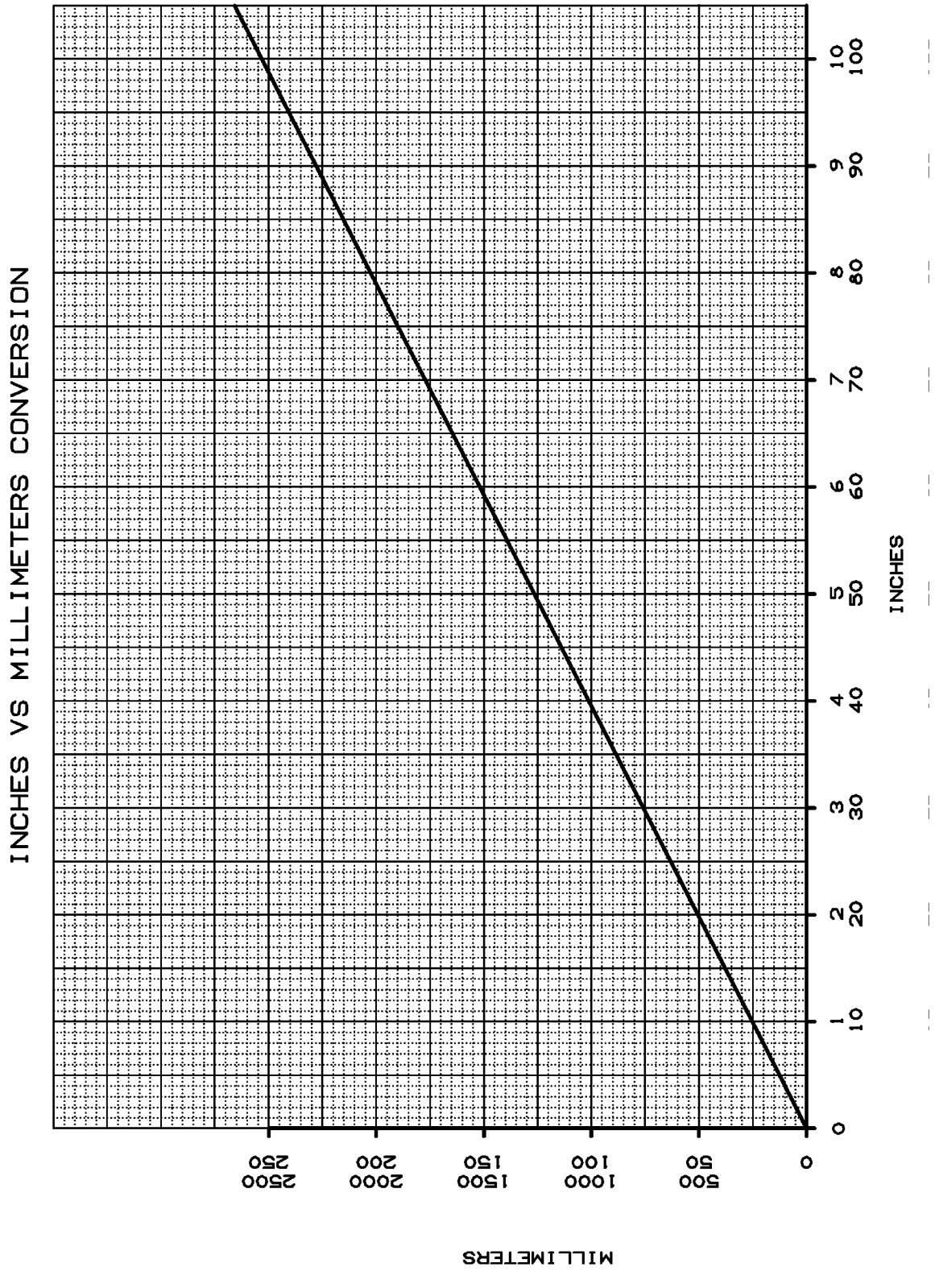


Figure 5-2. FEET VS. METERS CONVERSION



FM_5_3

Figure 5-3. INCHES VS. MILLIMETERS CONVERSION

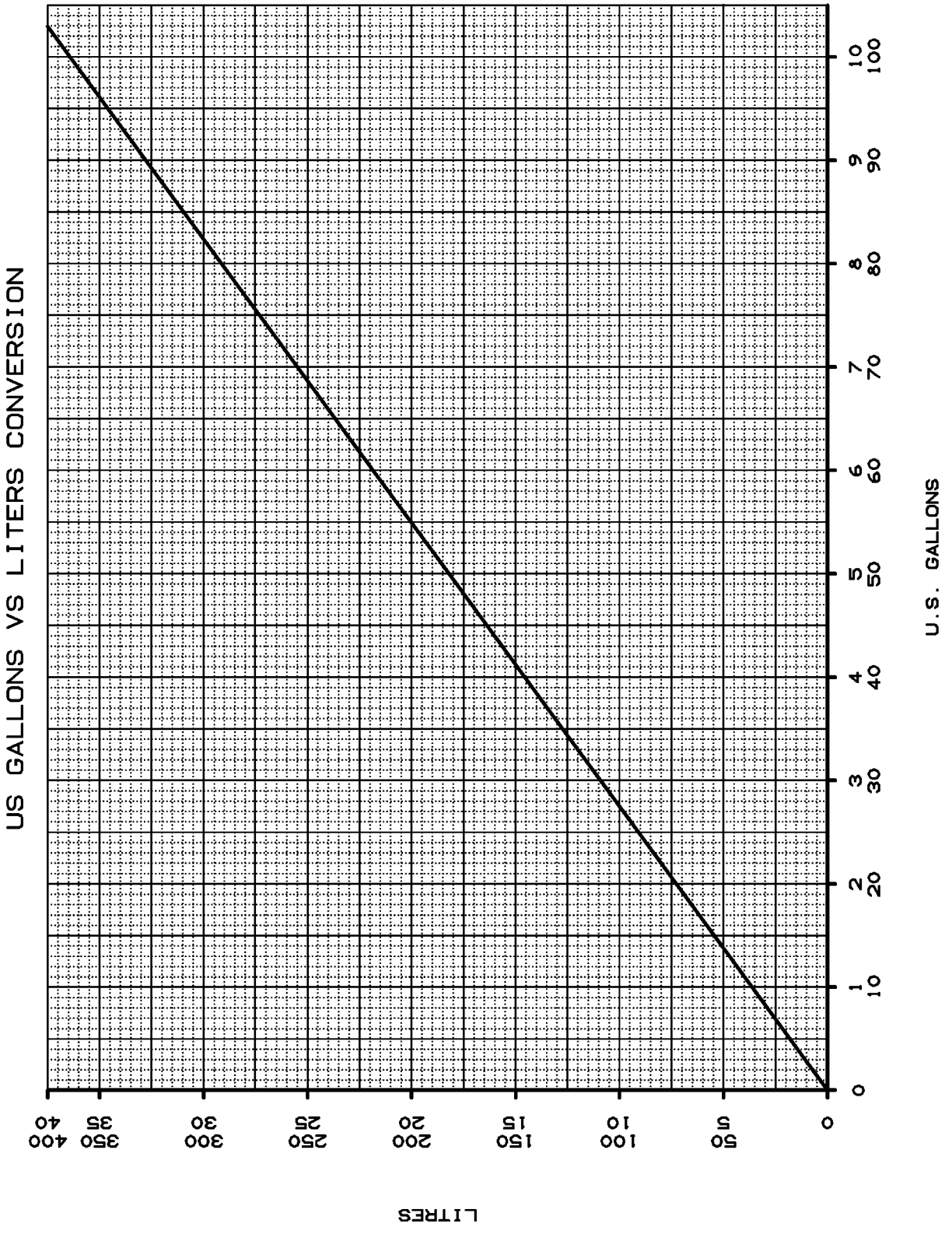
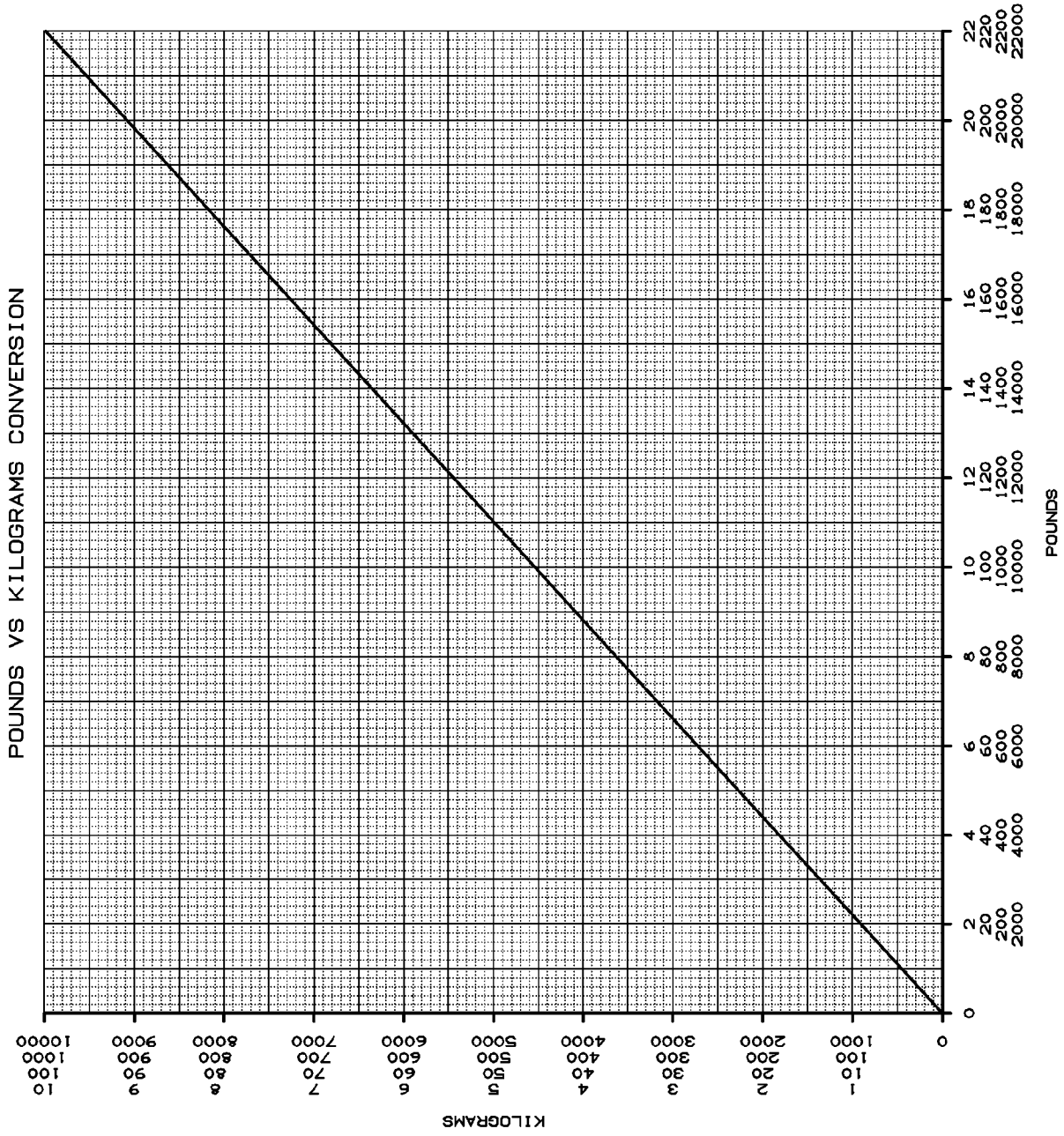
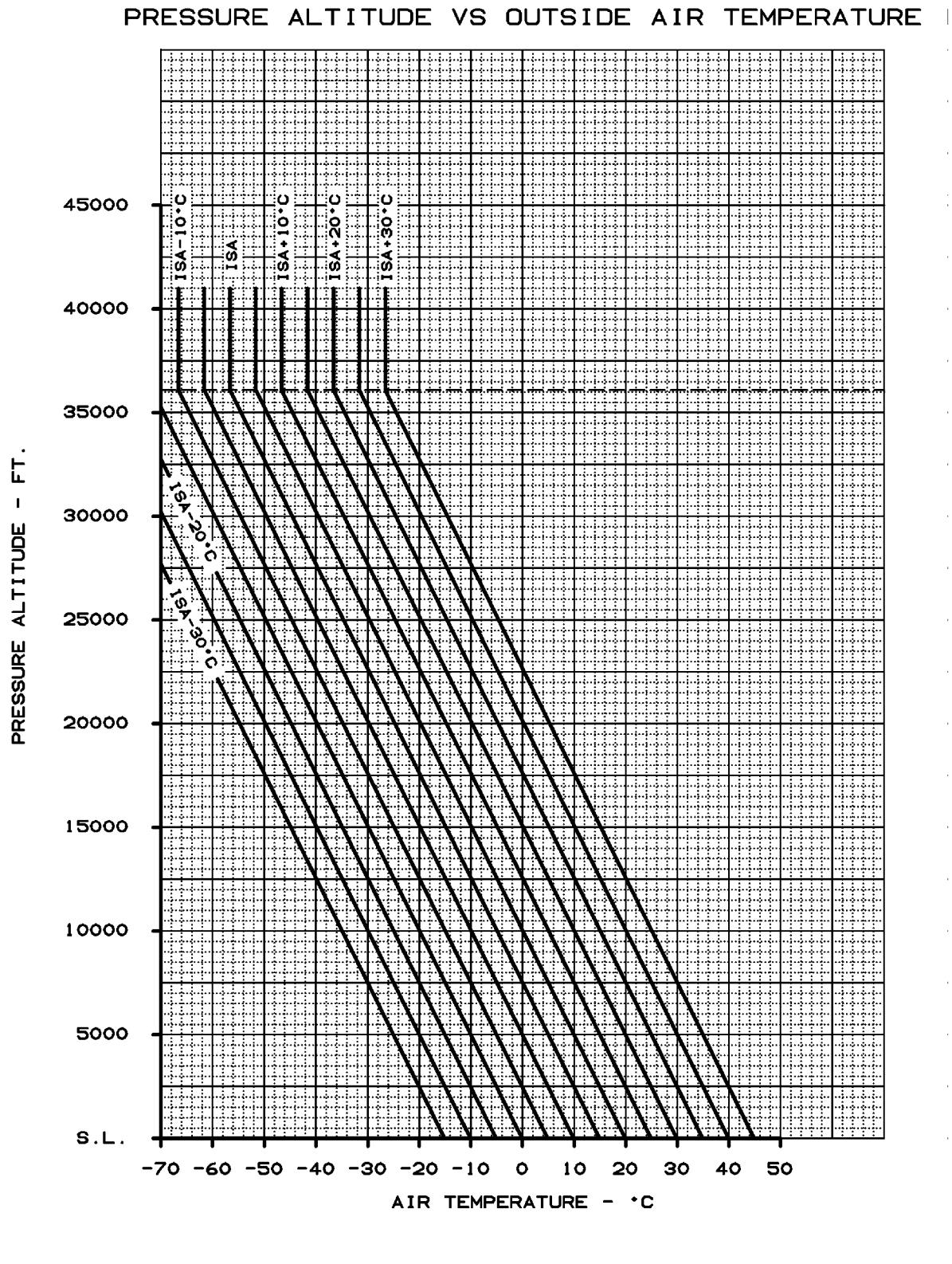


Figure 5-4. U.S. GALLONS VS. LITERS CONVERSION



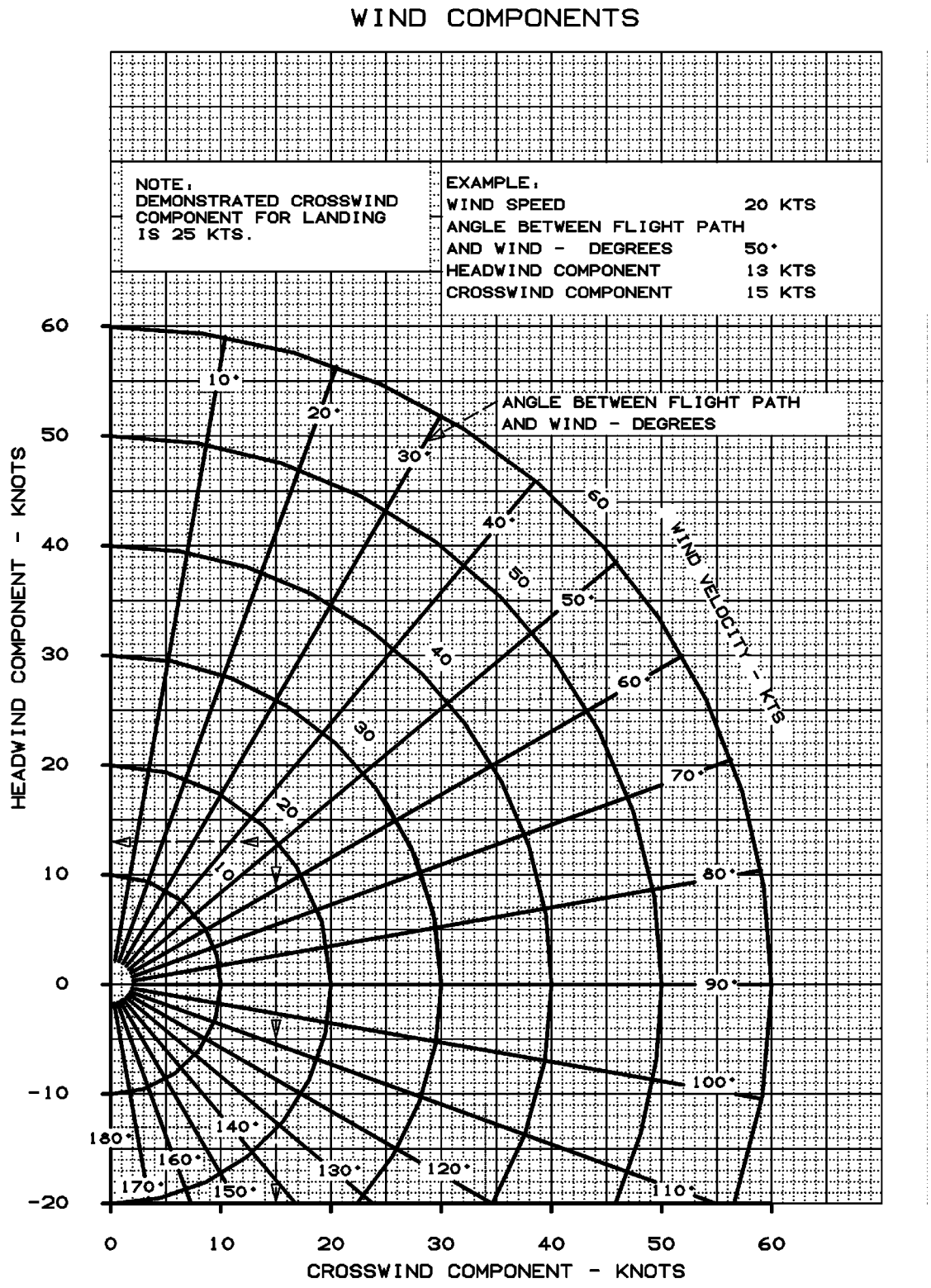
FM_5_5

Figure 5-5. POUNDS VS. KILOGRAMS CONVERSION



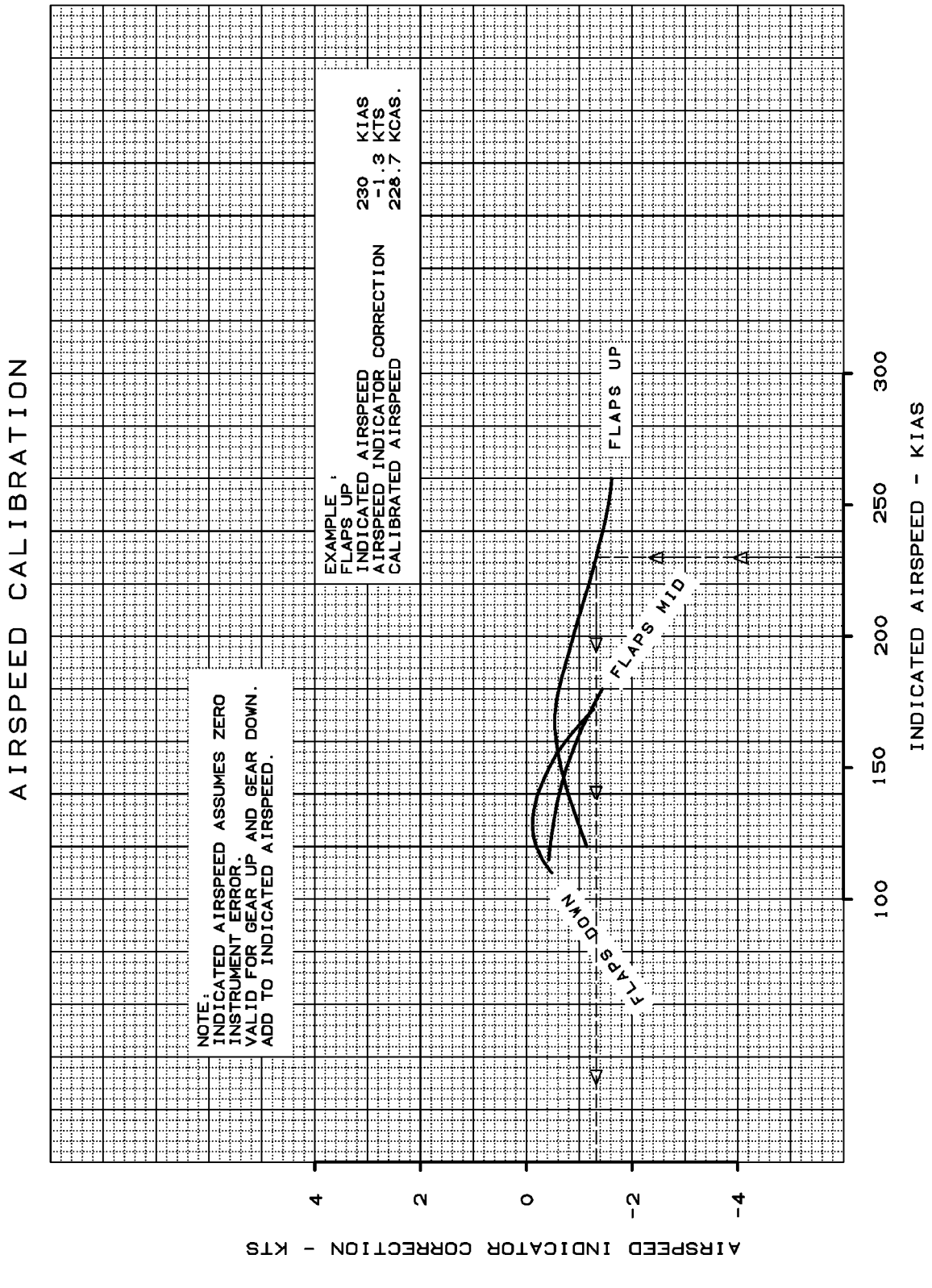
FM_5_6

Figure 5-6. ISA CONVERSION



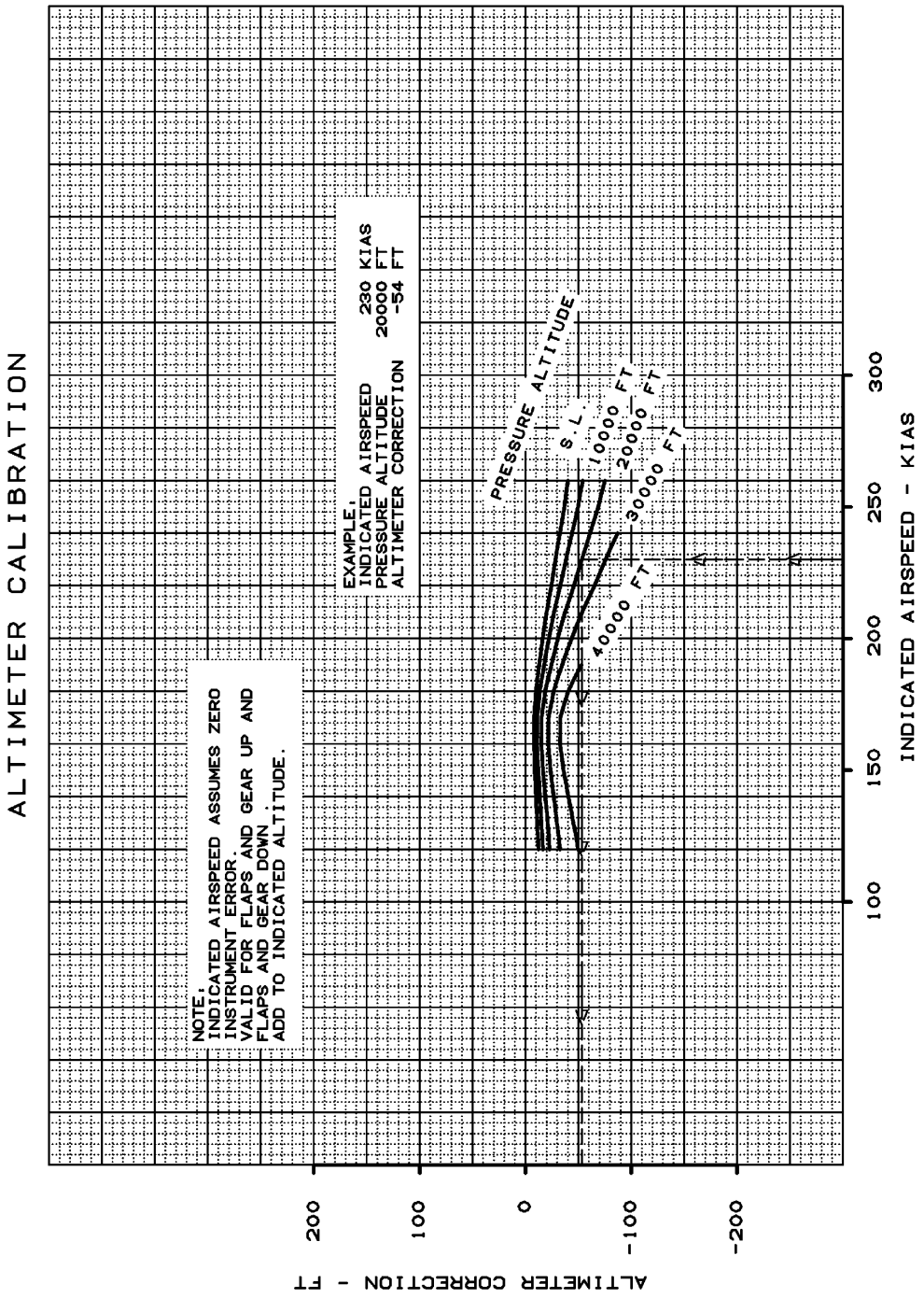
FM_5_7

Figure 5-7. WIND COMPONENTS



FM_5_8

Figure 5-8. AIRSPEED CALIBRATION



NOTE

The Altimeter Calibration is applicable only to the Barometric Altimeters not connected to the Air Data Computer ADC-85( ) and not provided with Static Source Error Correction.

Figure 5-9. ALTIMETER CALIBRATION

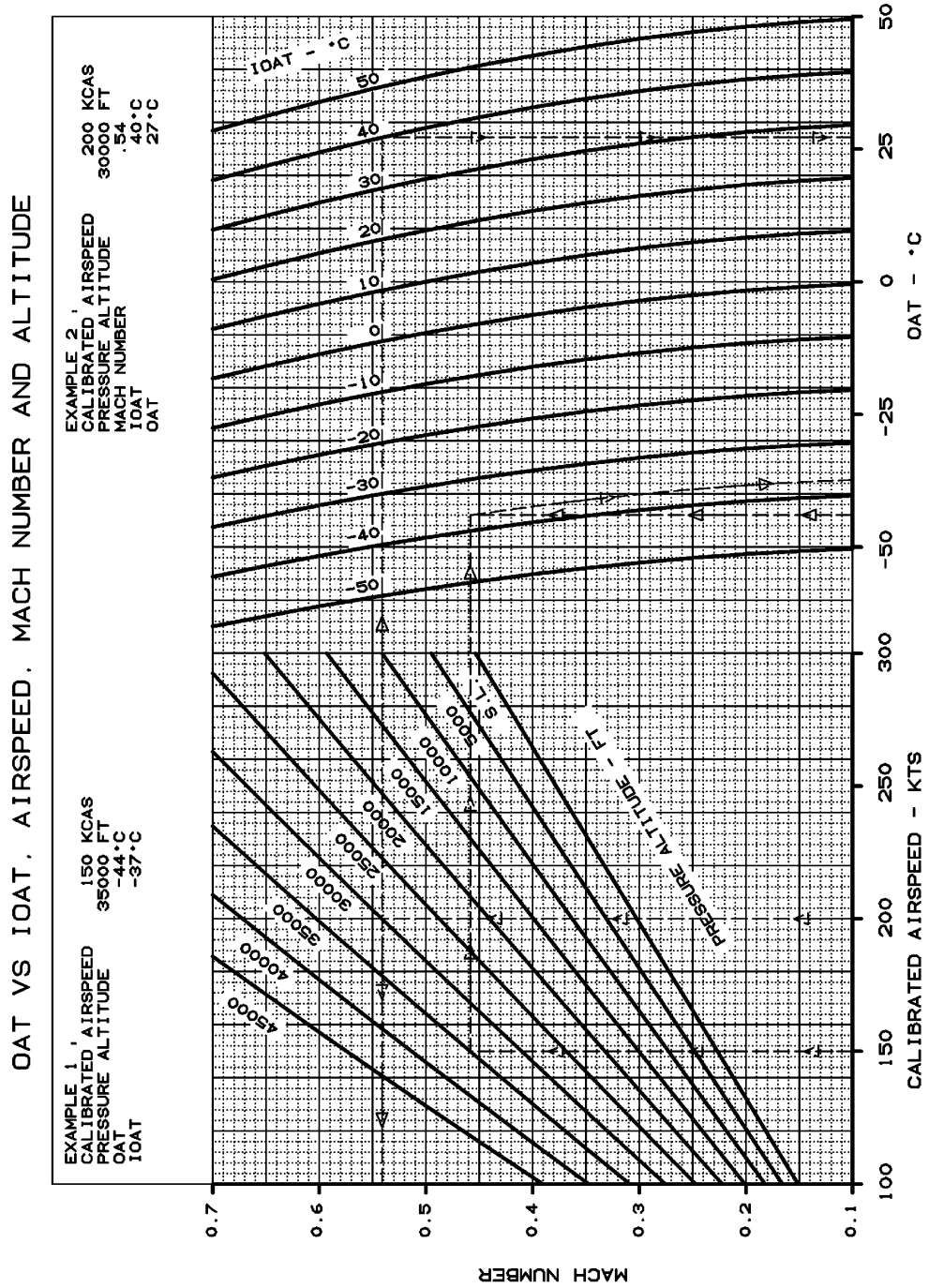


Figure 5-10. OAT VS. IOAT, AIRSPEED, MACH NUMBER AND ALTITUDE

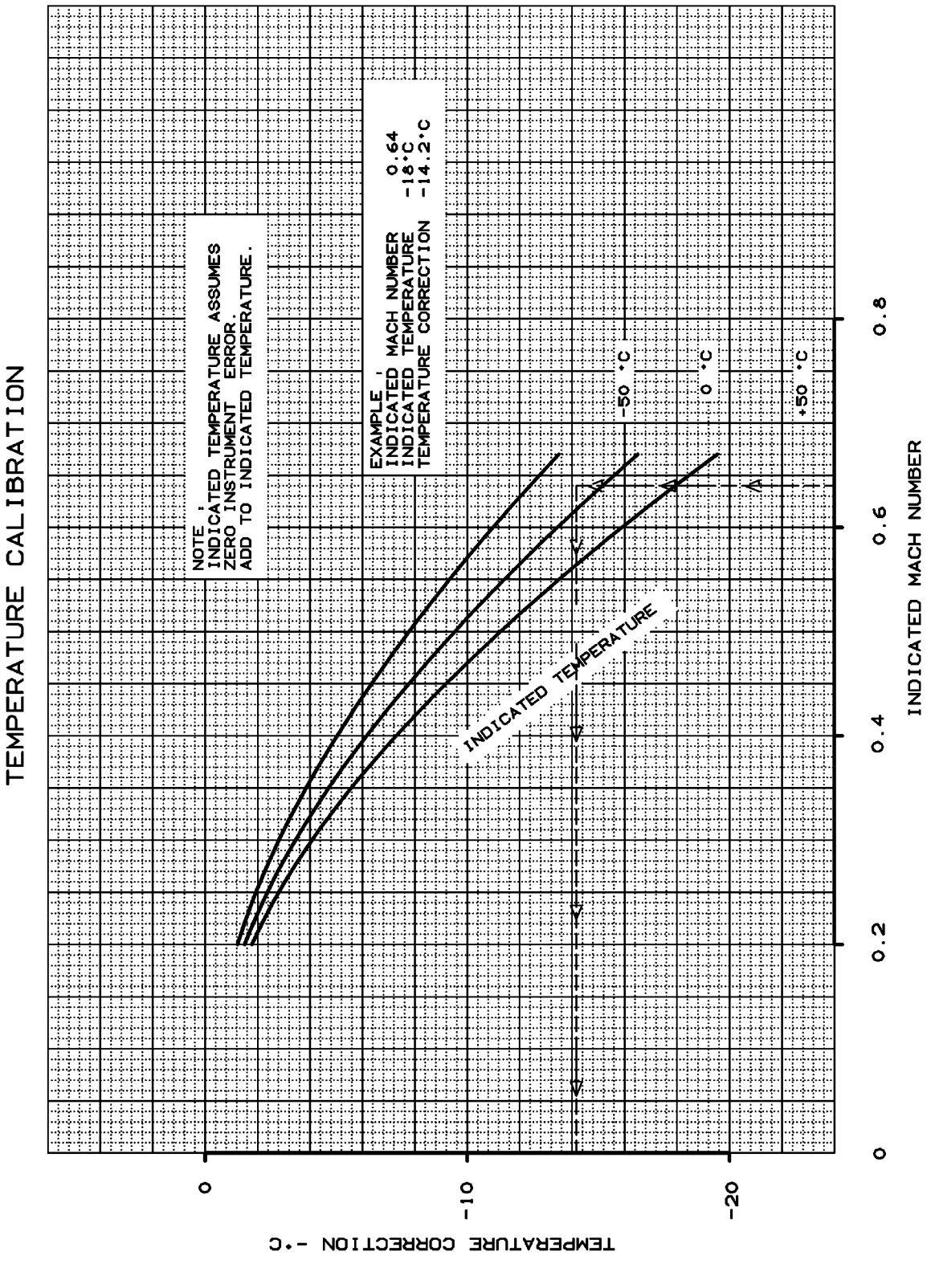


Figure 5-11. TEMPERATURE CALIBRATION

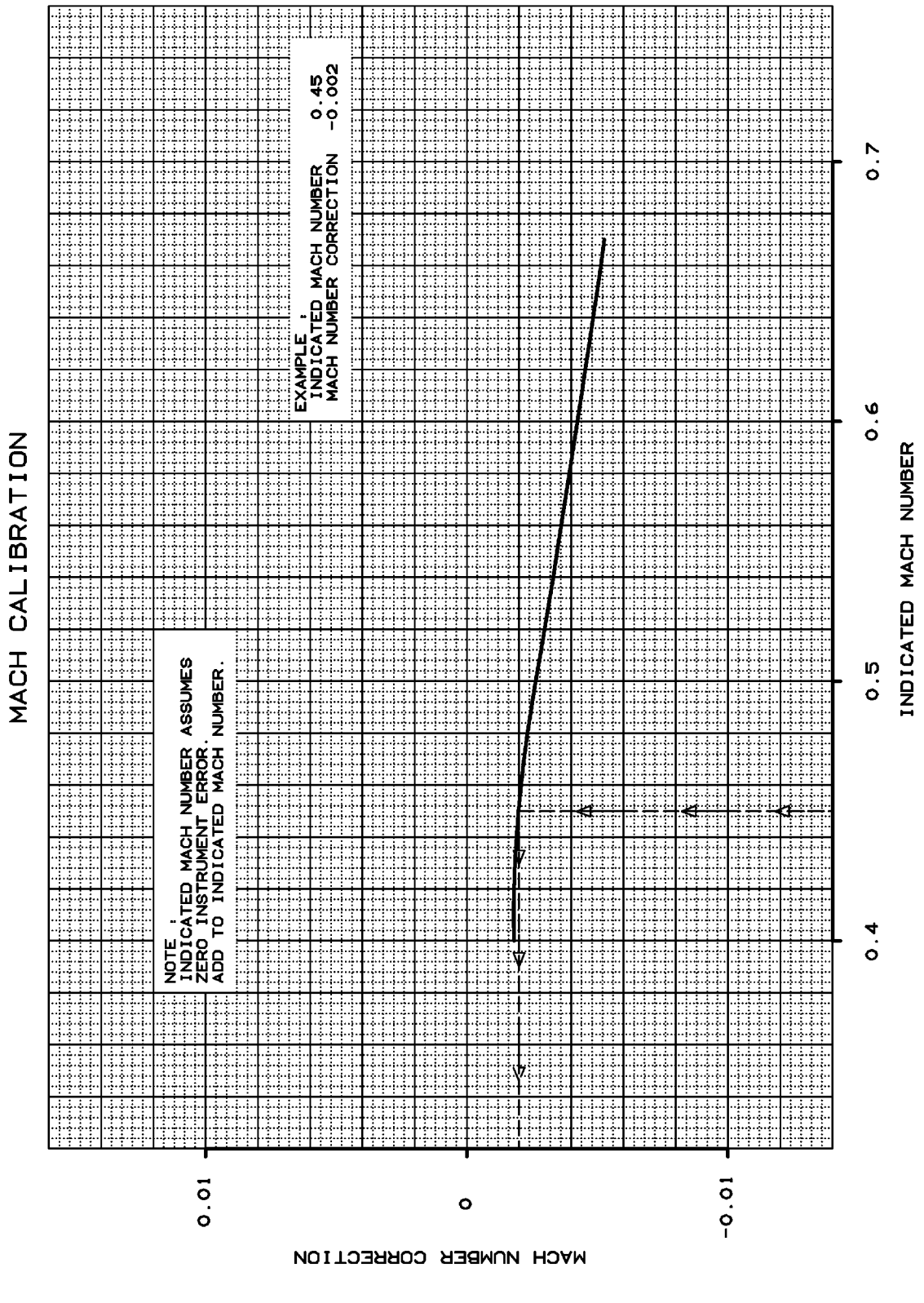
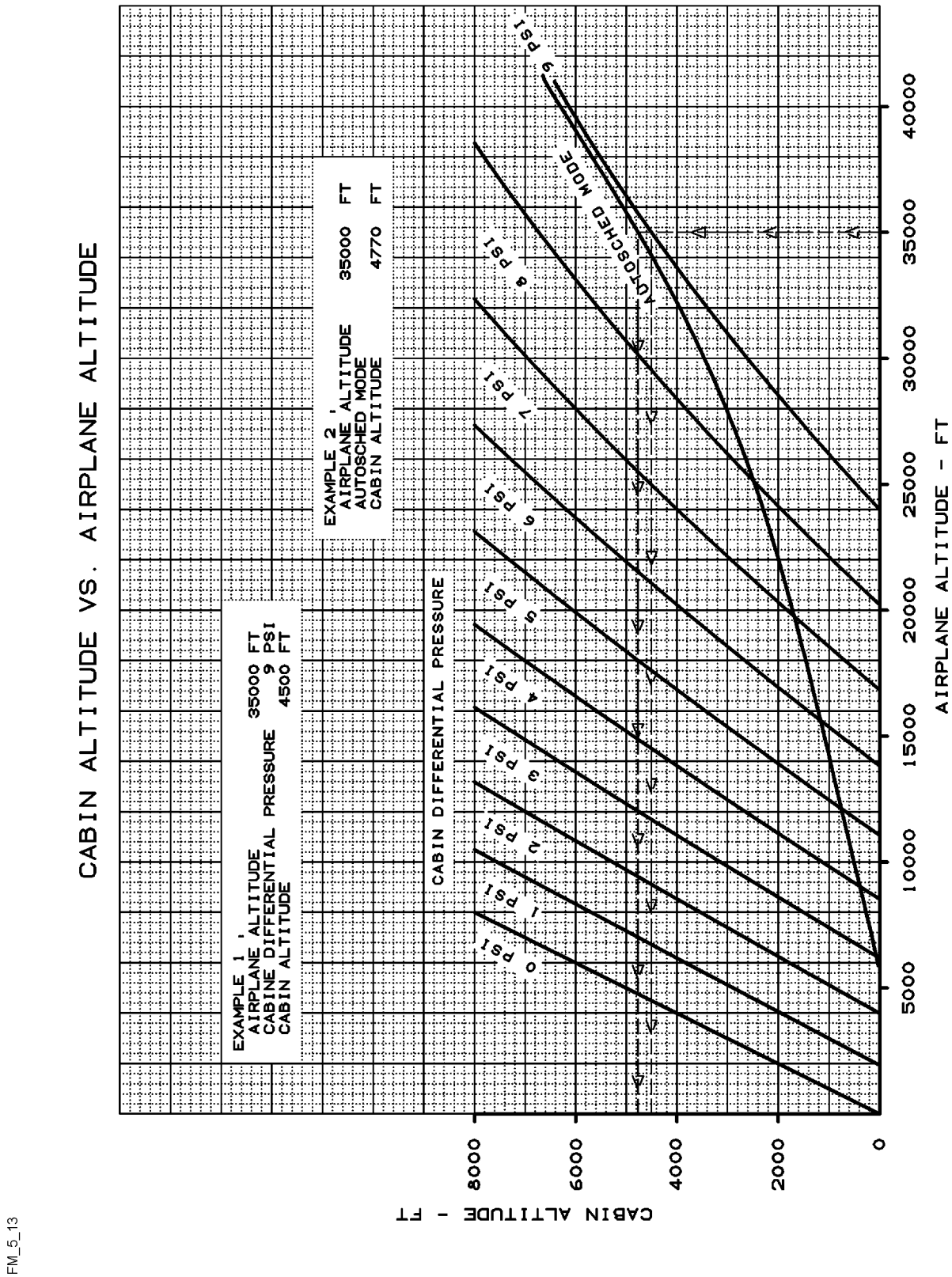
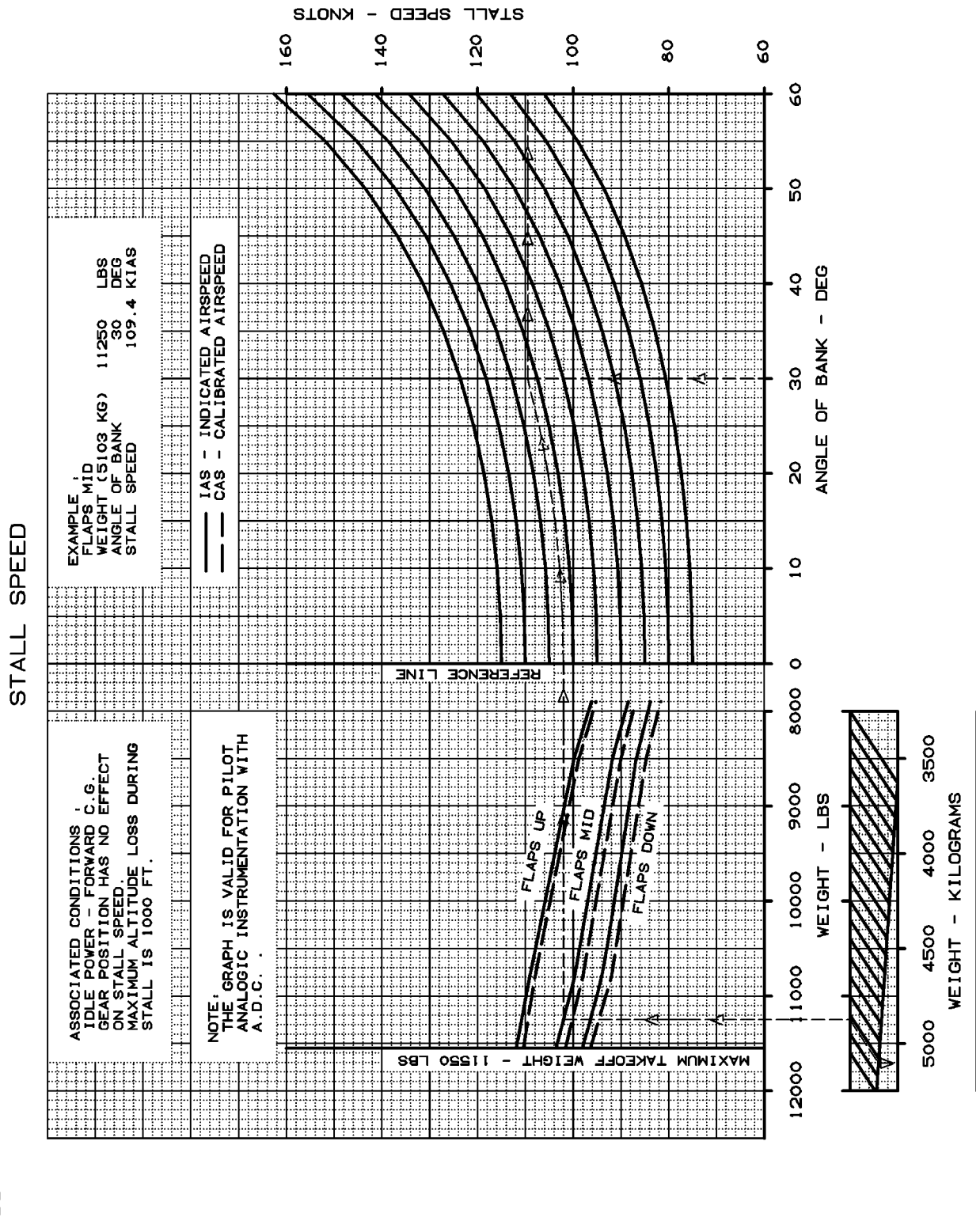


Figure 5-12. MACH CALIBRATION



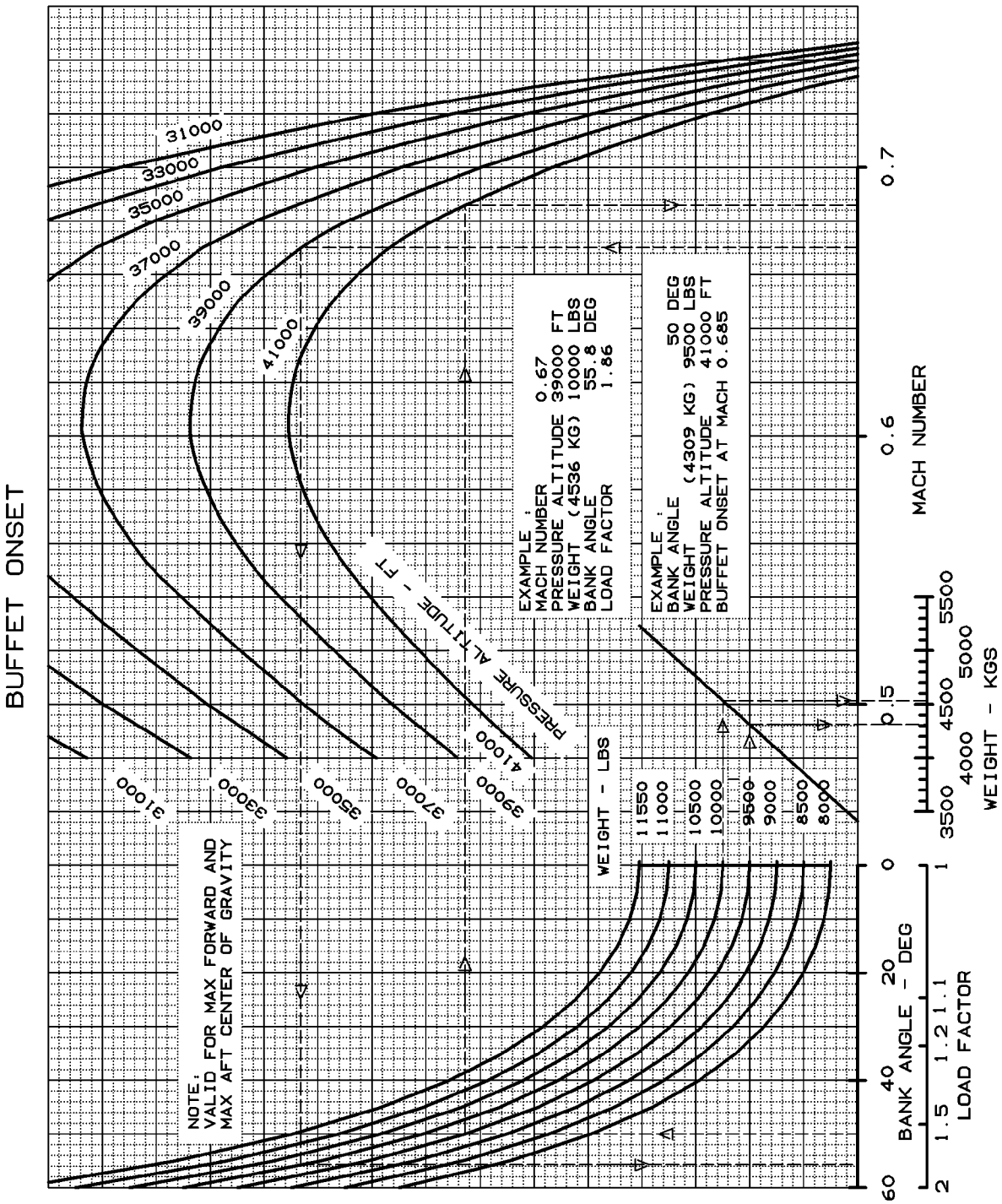
FM_5_13

Figure 5-13. CABIN ALTITUDE VS. AIRPLANE ALTITUDE



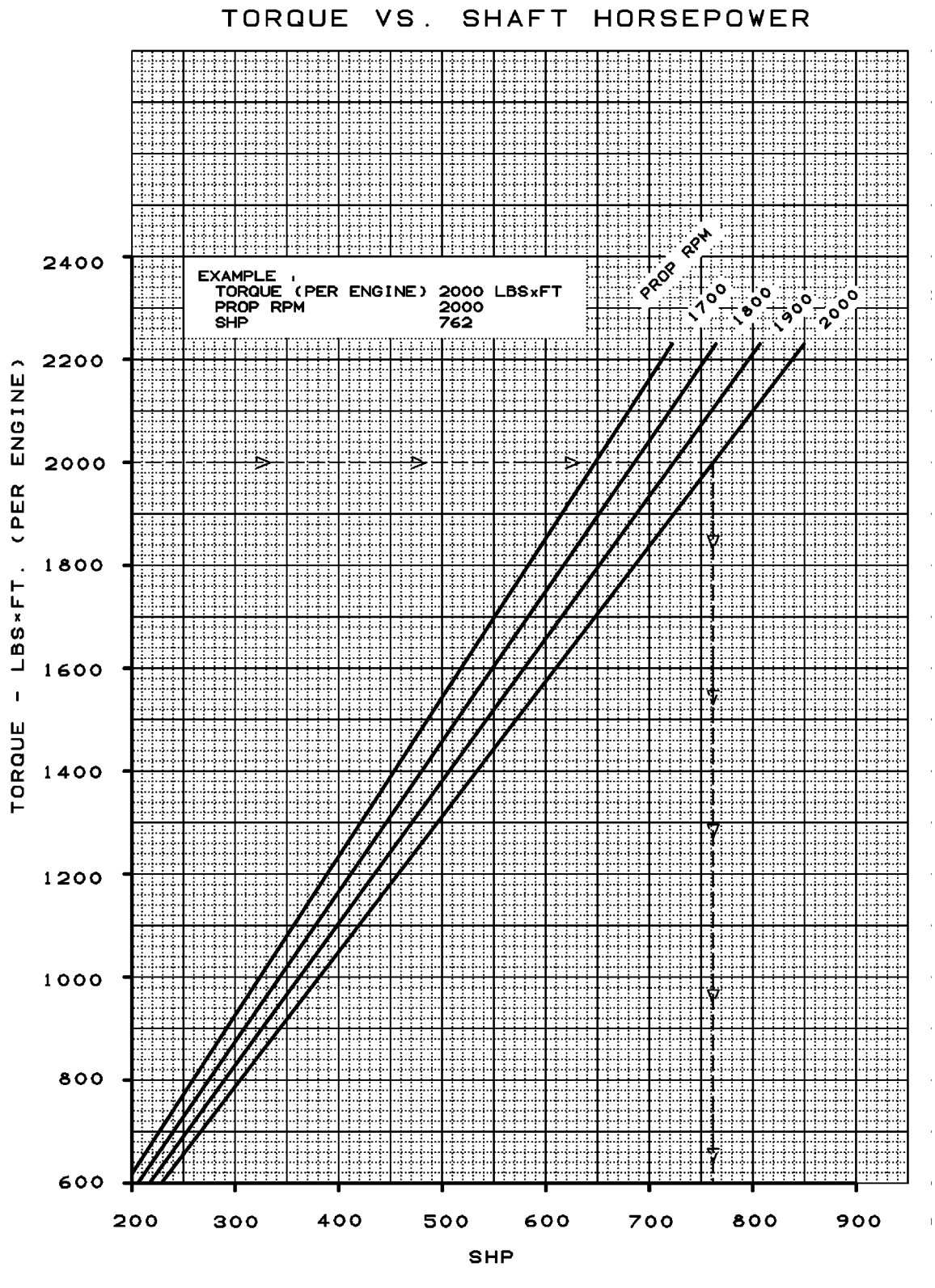
FM_5_14

Figure 5-14. STALL SPEED



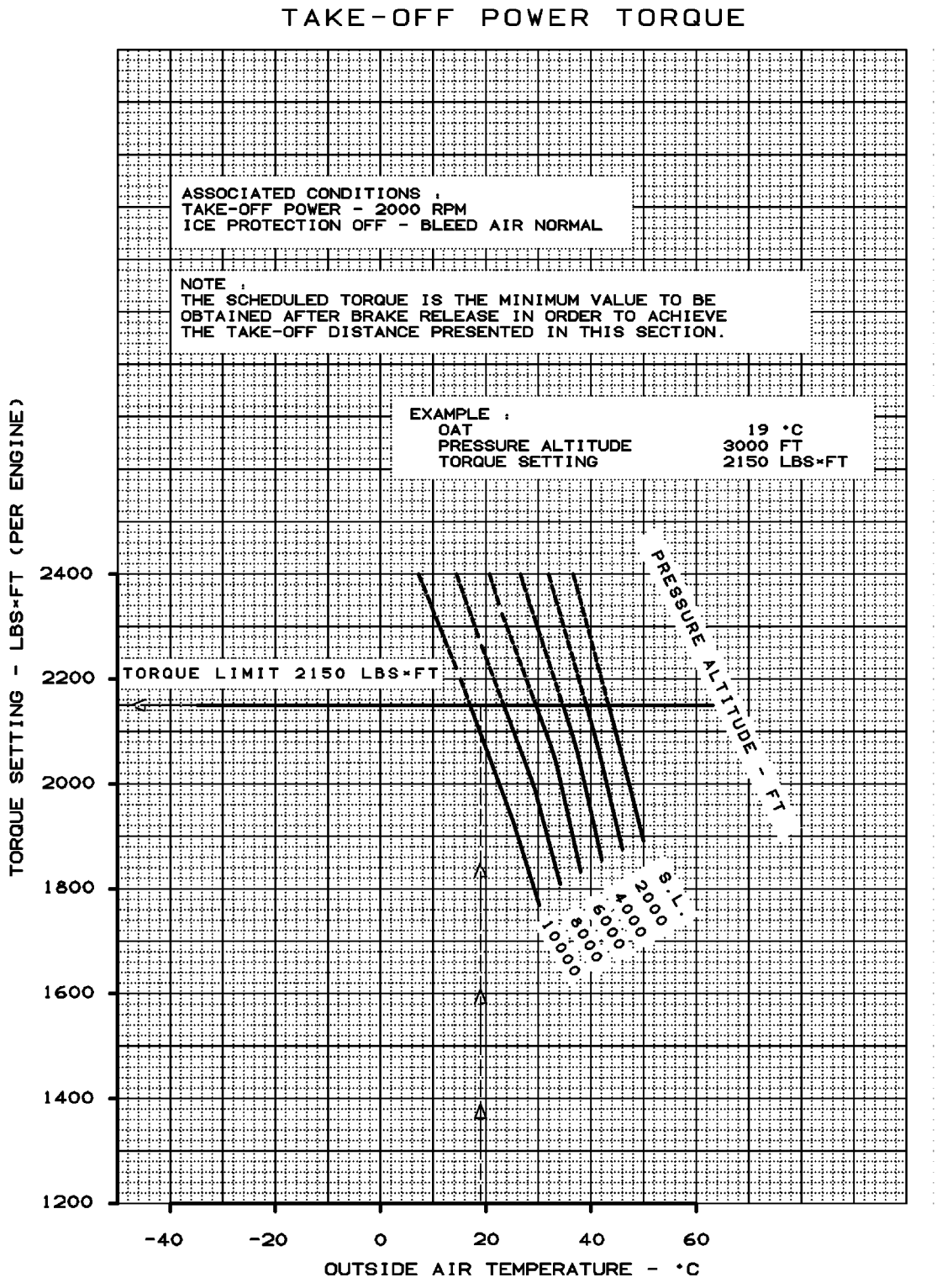
FM_5_15

Figure 5-15. BUFFET ONSET LIMITS



FM_5_16

Figure 5-16. TORQUE VS.SHAFT HORSEPOWER



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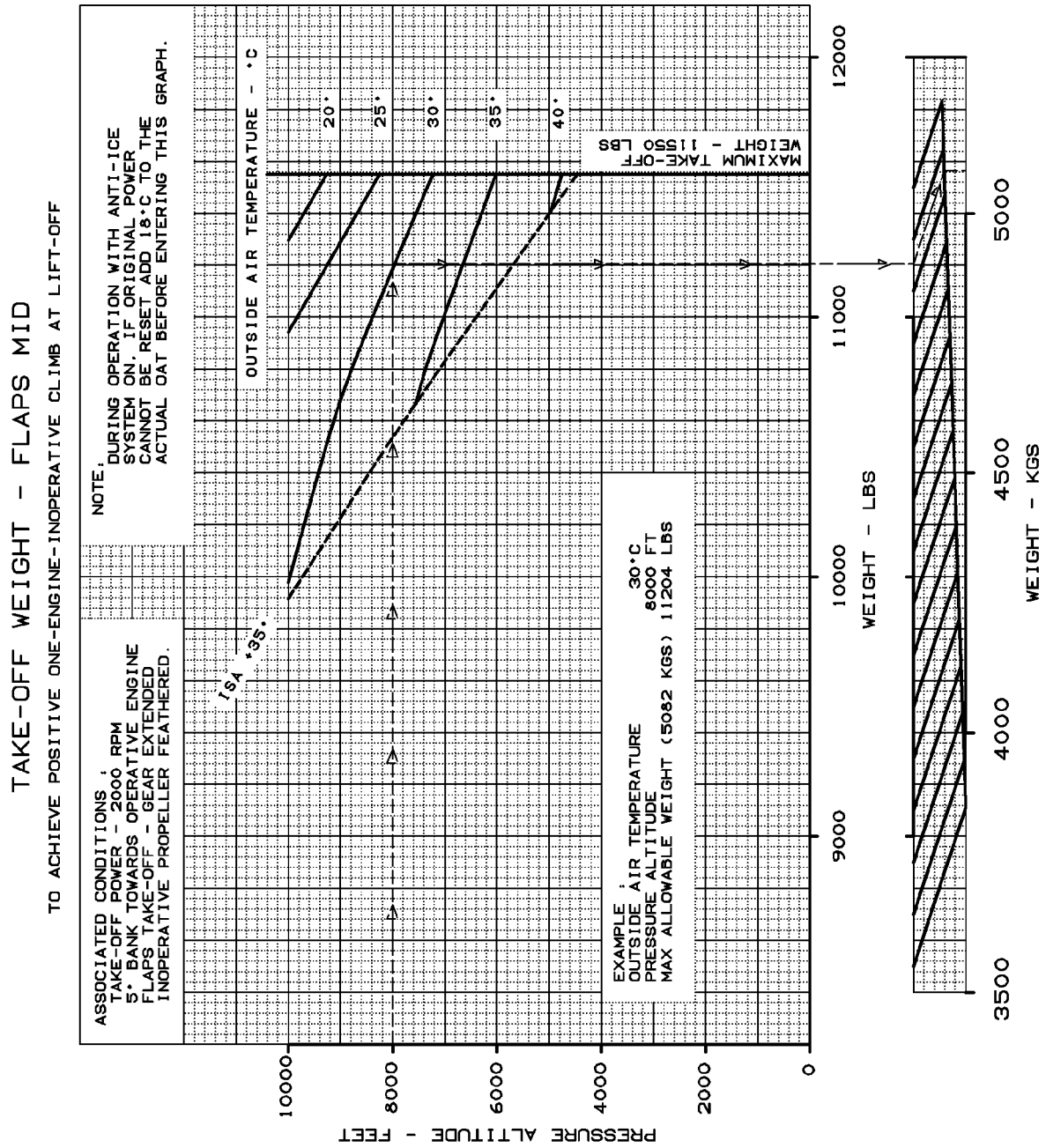
NOTE

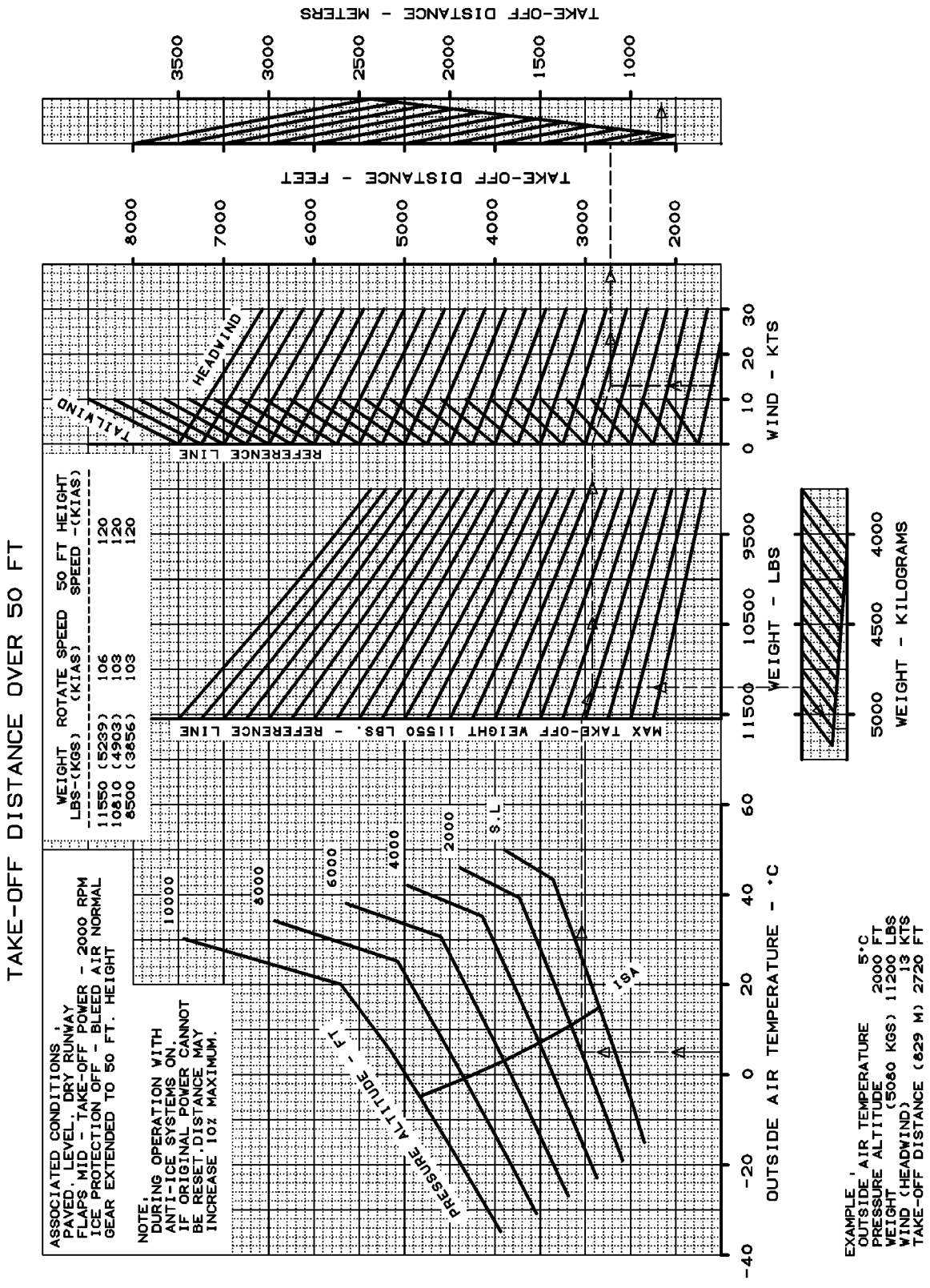
Torque limit of 2150 lb.ft. is the static value to be applied for takeoff in order to obtain the normal 2230 lb.ft. at takeoff speed for ram effect during the takeoff run.

Figure 5-17. TAKEOFF POWER TORQUE



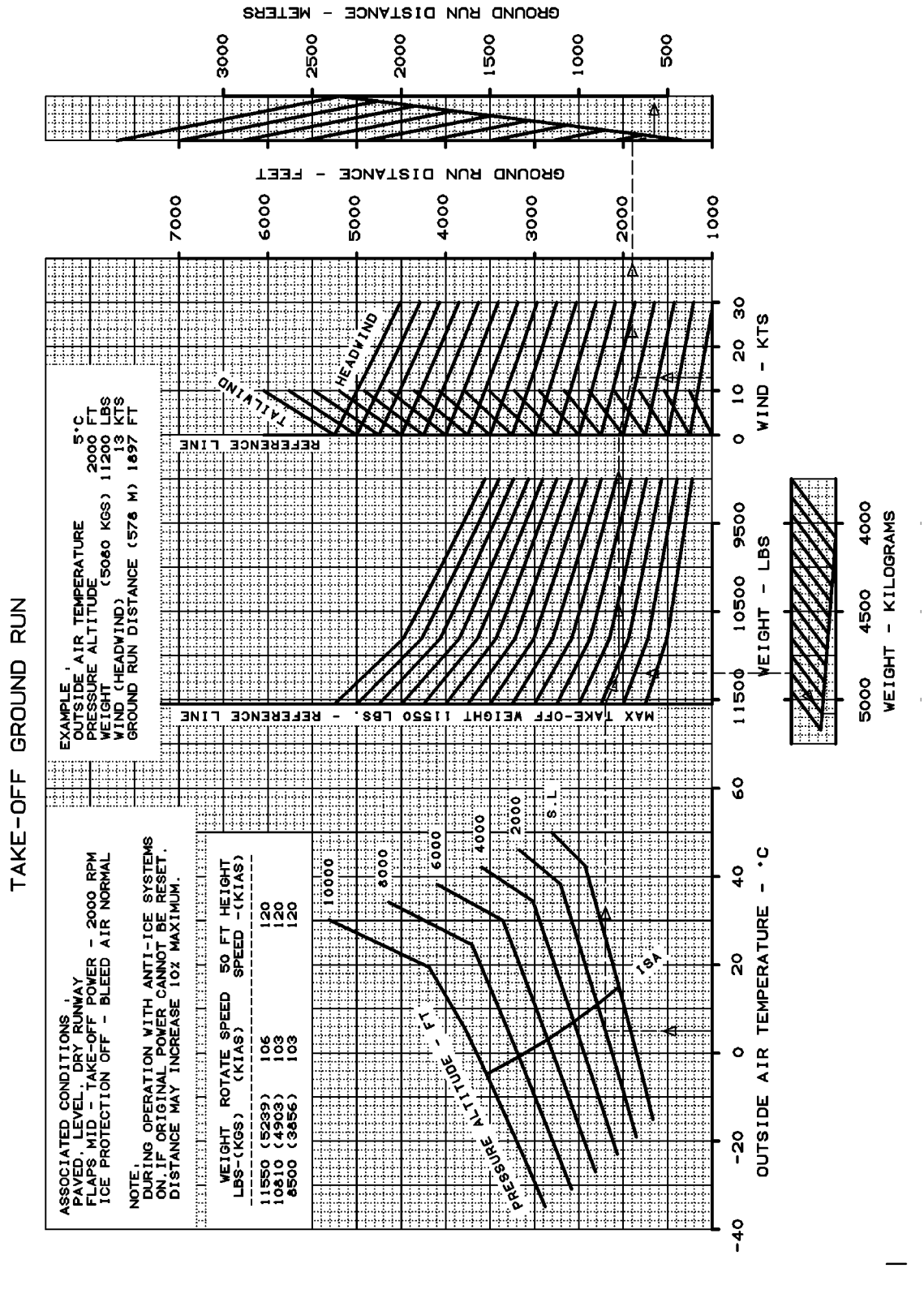
FM_5_18

Figure 5-18. TAKEOFF WEIGHT - FLAPS MID



FM_5_19

Figure 5-19. TAKE OFF DISTANCE OVER 50 FEET


TAKE-OFF GROUND RUN
ASSOCIATED CONDITIONS :
PAVED, LEVEL, DRY RUNWAY
FLAPS MID - TAKE-OFF POWER - 2000 RPM
ICE PROTECTION OFF - BLEED AIR NORMAL
NOTE:
DURING OPERATION WITH ANTI-ICE SYSTEMS ON, IF ORIGINAL POWER CANNOT BE RESET, DISTANCE MAY INCREASE 10% MAXIMUM.
WEIGHT LBS-(KGS) ROTATE SPEED (KIAS) 50 FT HEIGHT SPEED -(KIAS)
11550 (5239) 106 120
10810 (4903) 103 120
8500 (3856) 103 120
EXAMPLE :
OUTSIDE AIR TEMPERATURE 5°C
PRESSURE ALTITUDE 2000 FT
WEIGHT (5060 KGS) 11200 LBS
WIND (HEADWIND) 13 KTS
GROUND RUN DISTANCE (576 M) 1897 FT
REFERENCE LINE
MAX TAKE-OFF WEIGHT 11550 LBS. - REFERENCE LINE
PRESSURE ALTITUDE - FT.
10000
8000
6000
4000
2000
S.L
ISA
OUTSIDE AIR TEMPERATURE - °C
-40 -20 0 20 40 60
WEIGHT - LBS
11500 10500 9500
WEIGHT - KILOGRAMS
5000 4500 4000
WIND - KTS
0 10 20 30
HEADWIND
TAILWIND
GROUND RUN DISTANCE - FEET
7000 6000 5000 4000 3000 2000 1000
GROUND RUN DISTANCE - METERS
3000 2500 2000 1500 1000 500

FM_5_20

Figure 5-20. TAKE OFF GROUND RUN

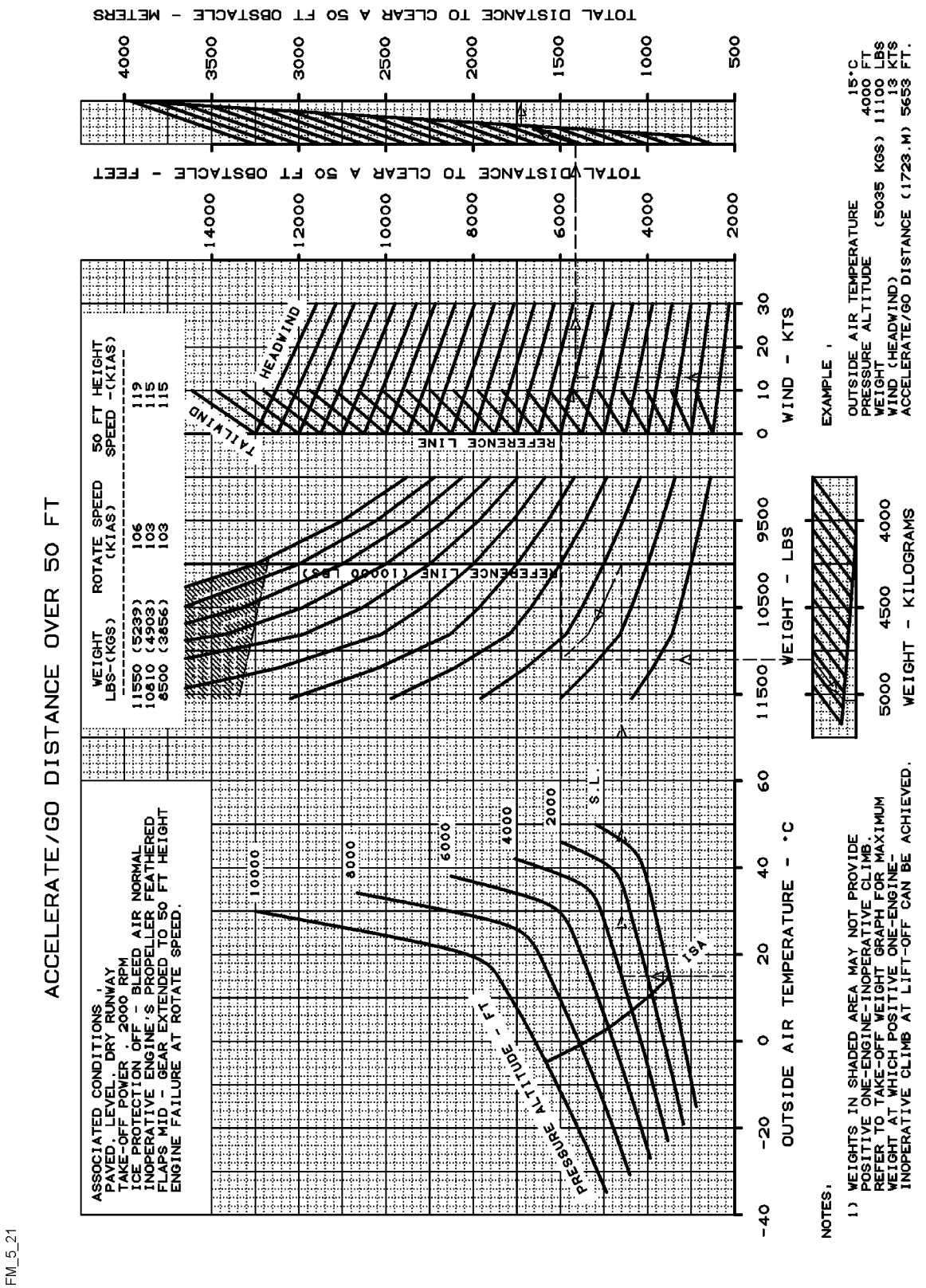

ACCELERATE/GO DISTANCE OVER 50 FT
TOTAL DISTANCE TO CLEAR A 50 FT OBSTACLE - METERS
TOTAL DISTANCE TO CLEAR A 50 FT OBSTACLE - FEET
ASSOCIATED CONDITIONS :
PAVED, LEVEL, DRY RUNWAY
TAKE-OFF POWER , 2000 RPM
ICE PROTECTION OFF - BLEED AIR NORMAL
INOPERATIVE ENGINE'S PROPELLER FEATHERED
FLAPS MID - GEAR EXTENDED TO 50 FT HEIGHT
ENGINE FAILURE AT ROTATE SPEED.
WEIGHT LBS-(KGS)
ROTATE SPEED (KIAS)
50 FT HEIGHT SPEED -(KIAS)
11550 (5239) 106 119
10810 (4903) 103 115
8500 (3856) 103 115
REFERENCE LINE (10000 LBS)
REFERENCE LINE
TAILWIND
HEADWIND
PRESSURE ALTITUDE - FT
S.L.
2000
4000
6000
8000
10000
ISA
OUTSIDE AIR TEMPERATURE - °C
WEIGHT - LBS
WEIGHT - KILOGRAMS
WIND - KTS
EXAMPLE :
OUTSIDE AIR TEMPERATURE 15°C
PRESSURE ALTITUDE 4000 FT
WEIGHT (5035 KGS) 11100 LBS
WIND (HEADWIND) 13 KTS
ACCELERATE/GO DISTANCE (1723.M) 5653 FT.
NOTES:
1) WEIGHTS IN SHADED AREA MAY NOT PROVIDE POSITIVE ONE-ENGINE-INOPERATIVE CLIMB. REFER TO TAKE-OFF WEIGHT GRAPH FOR MAXIMUM WEIGHT AT WHICH POSITIVE ONE-ENGINE-INOPERATIVE CLIMB AT LIFT-OFF CAN BE ACHIEVED.
2) DURING OPERATION WITH ANTI-ICE SYSTEMS ON, IF ORIGINAL POWER CANNOT BE RESET, DISTANCE MAY INCREASE 20 % MAXIMUM.
FM_5_21

Figure 5-21. ACCELERATE AND GO DISTANCE OVER 50 FEET

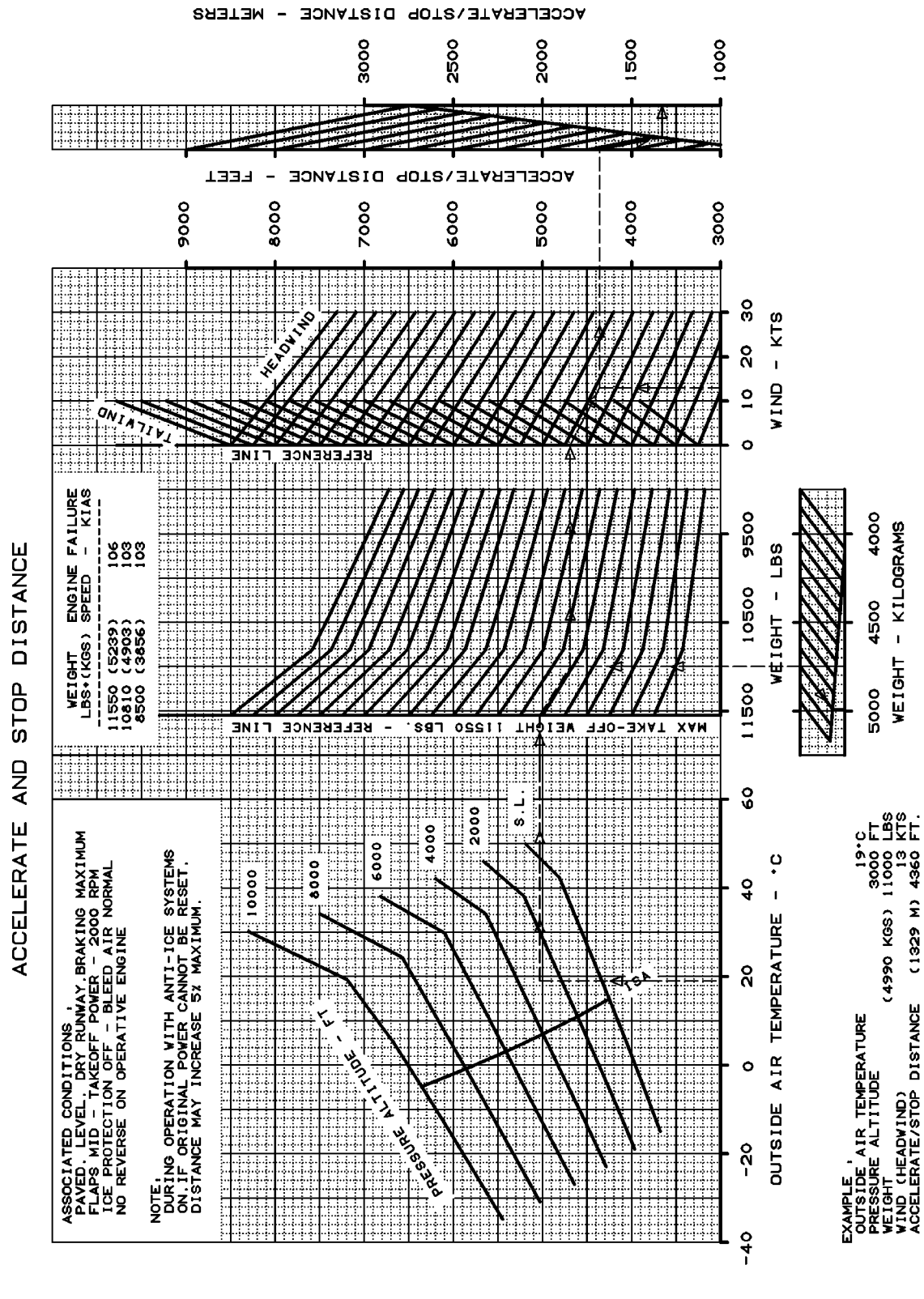
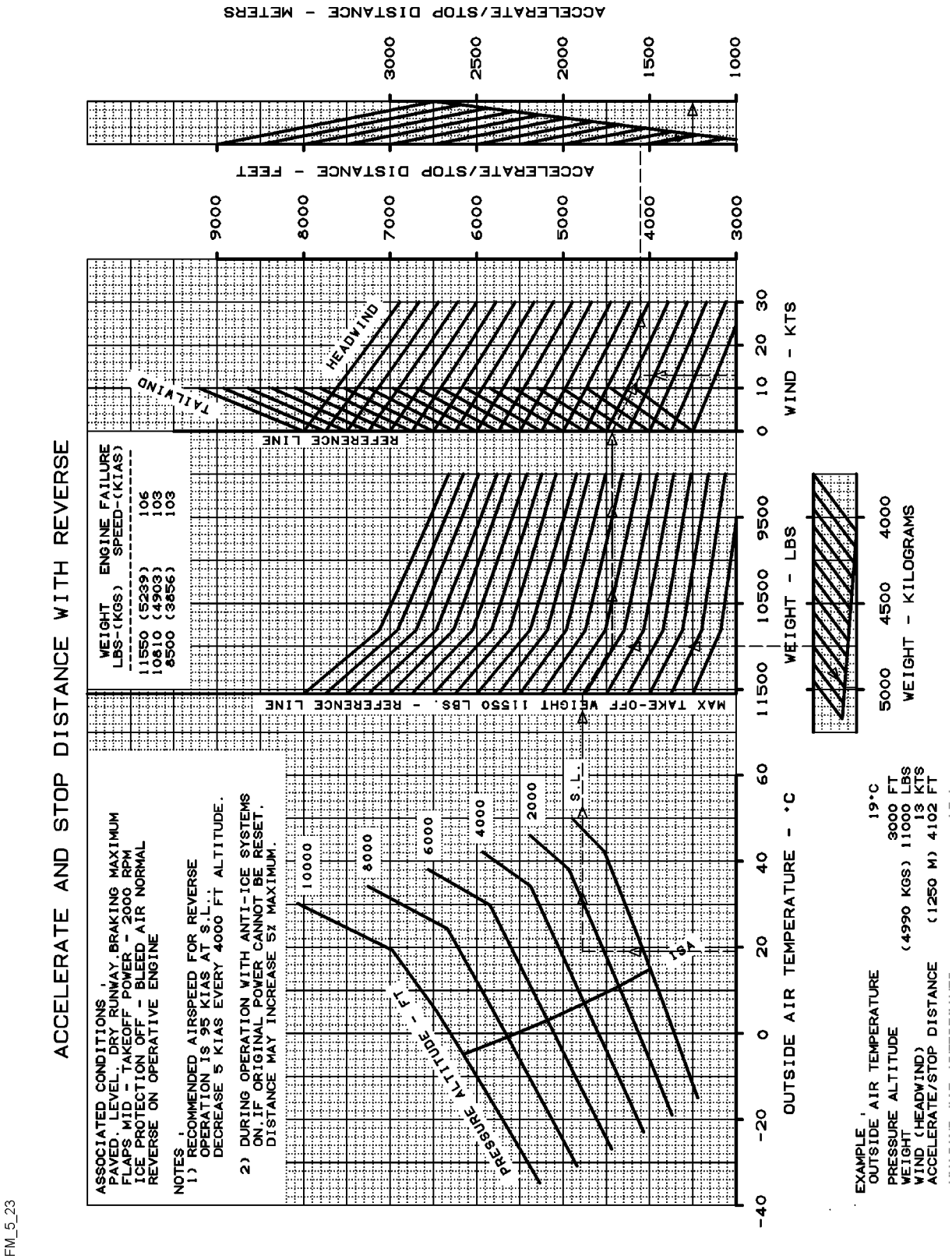

ACCELERATE AND STOP DISTANCE
ACCELERATE/STOP DISTANCE - METERS
ACCELERATE/STOP DISTANCE - FEET
WIND - KTS
WEIGHT - LBS
WEIGHT - KILOGRAMS
OUTSIDE AIR TEMPERATURE - °C
PRESSURE ALTITUDE - FT
HEADWIND
TAILWIND
REFERENCE LINE
MAX TAKE-OFF WEIGHT 11550 LBS. - REFERENCE LINE
WEIGHT LBS*(KGS) ENGINE FAILURE SPEED - KIAS
11550 (5239) 106
10810 (4903) 103
8500 (3856) 103
ASSOCIATED CONDITIONS :
PAVED, LEVEL, DRY RUNWAY, BRAKING MAXIMUM
FLAPS MID - TAKEOFF POWER - 2000 RPM
ICE PROTECTION OFF - BLEED AIR NORMAL
NO REVERSE ON OPERATIVE ENGINE
NOTE:
DURING OPERATION WITH ANTI-ICE SYSTEMS ON, IF ORIGINAL POWER CANNOT BE RESET, DISTANCE MAY INCREASE 5% MAXIMUM.
EXAMPLE :
OUTSIDE AIR TEMPERATURE 19°C
PRESSURE ALTITUDE 3000 FT
WEIGHT (4990 KGS) 11000 LBS
WIND (HEADWIND) 13 KTS
ACCELERATE/STOP DISTANCE (1329 M) 4360 FT.
FM_5_22

Figure 5-22. ACCELERATE AND STOP DISTANCE WITHOUT REVERSE



FM_5_23

Figure 5-23. ACCELERATE AND STOP DISTANCE WITH REVERSE

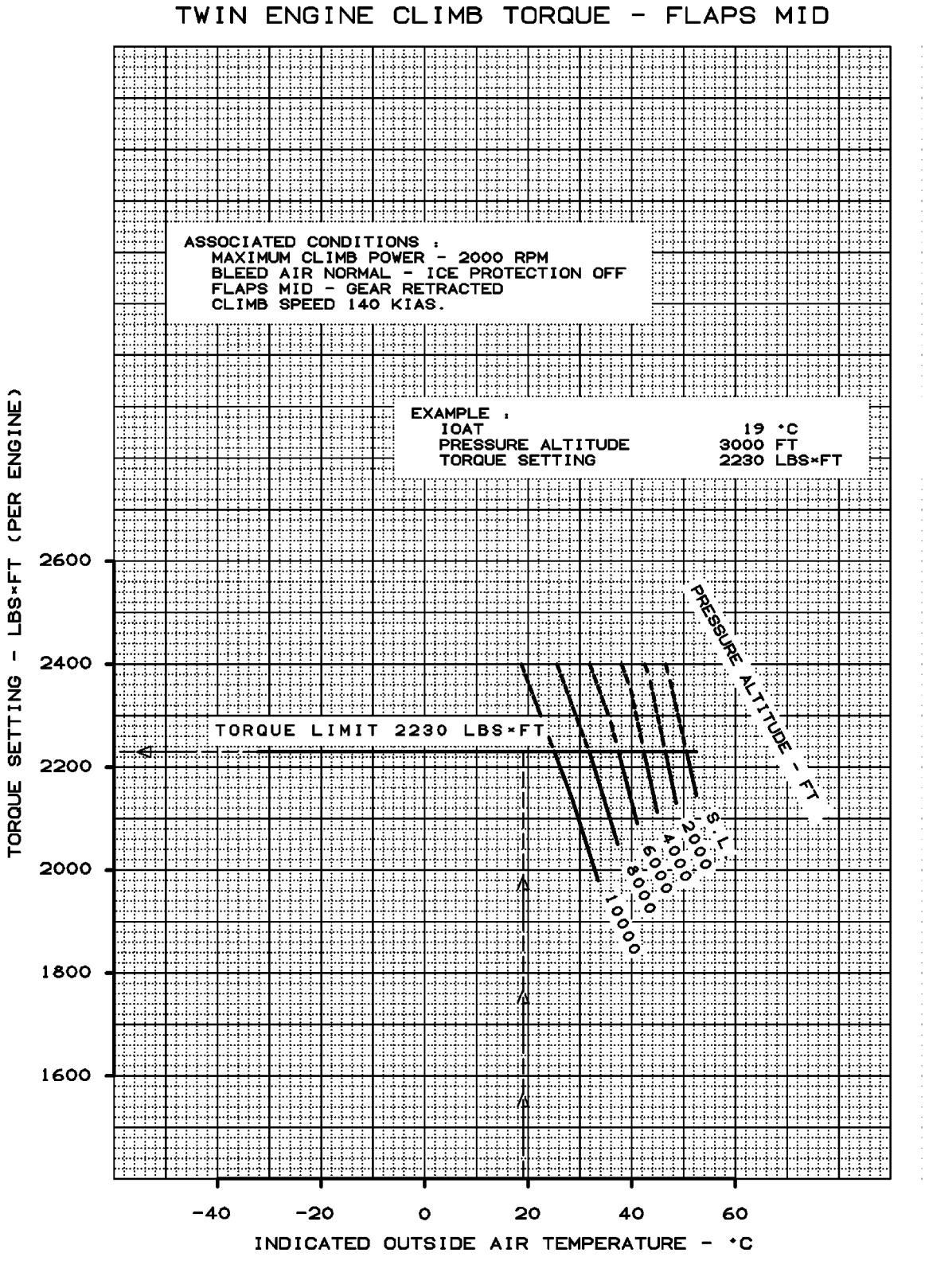


Figure 5-24. TWIN ENGINE CLIMB TORQUE - FLAPS MID

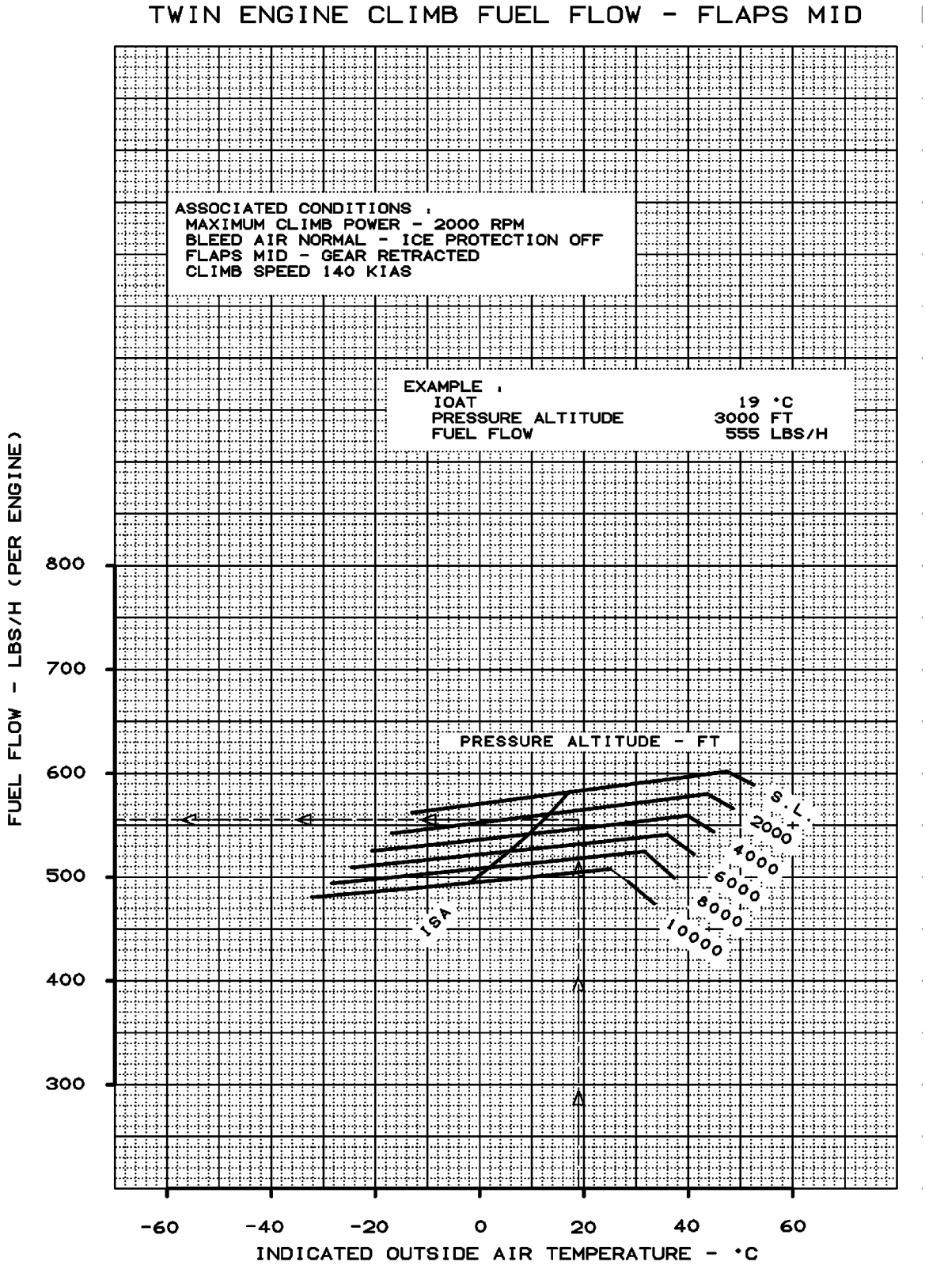
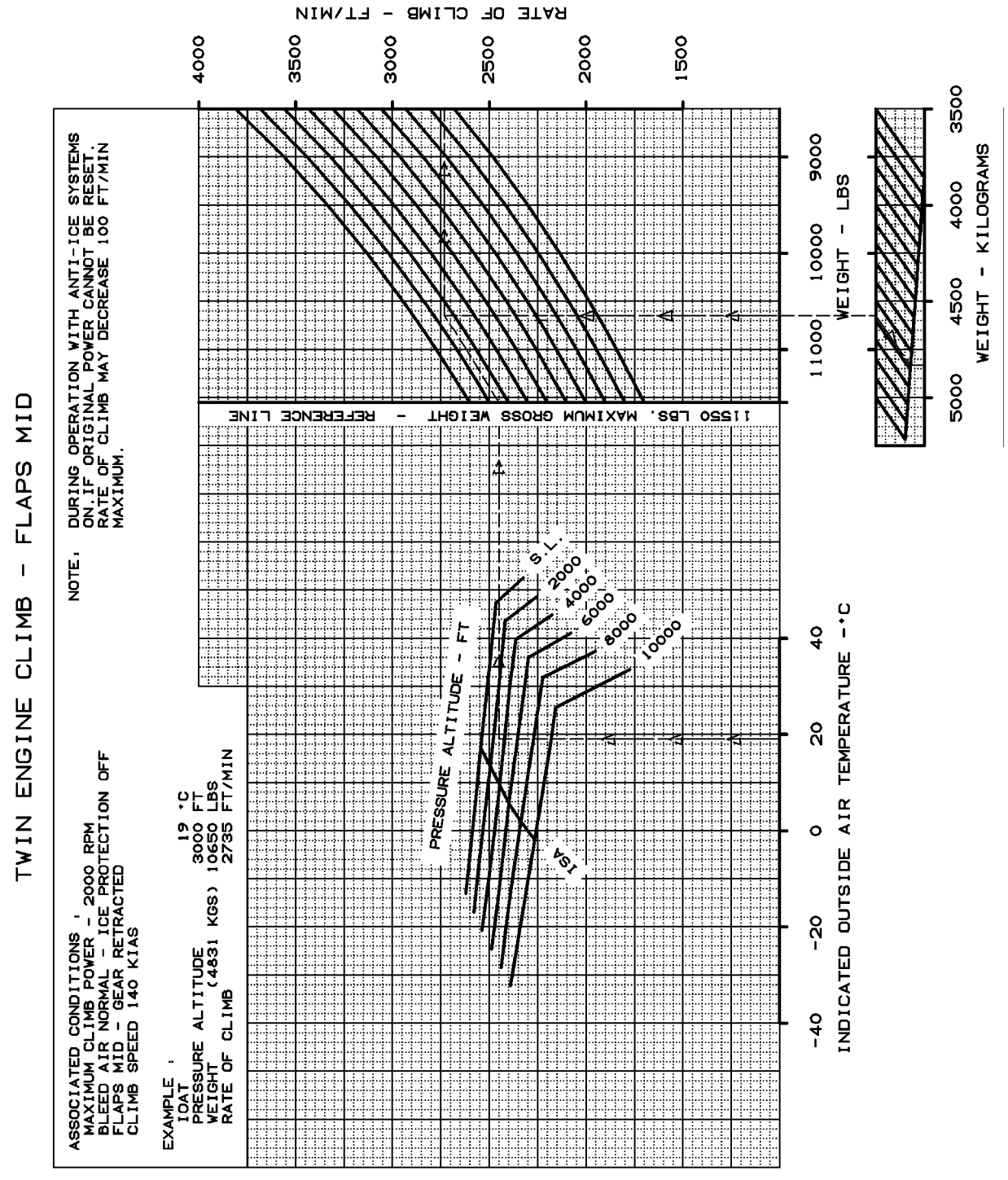
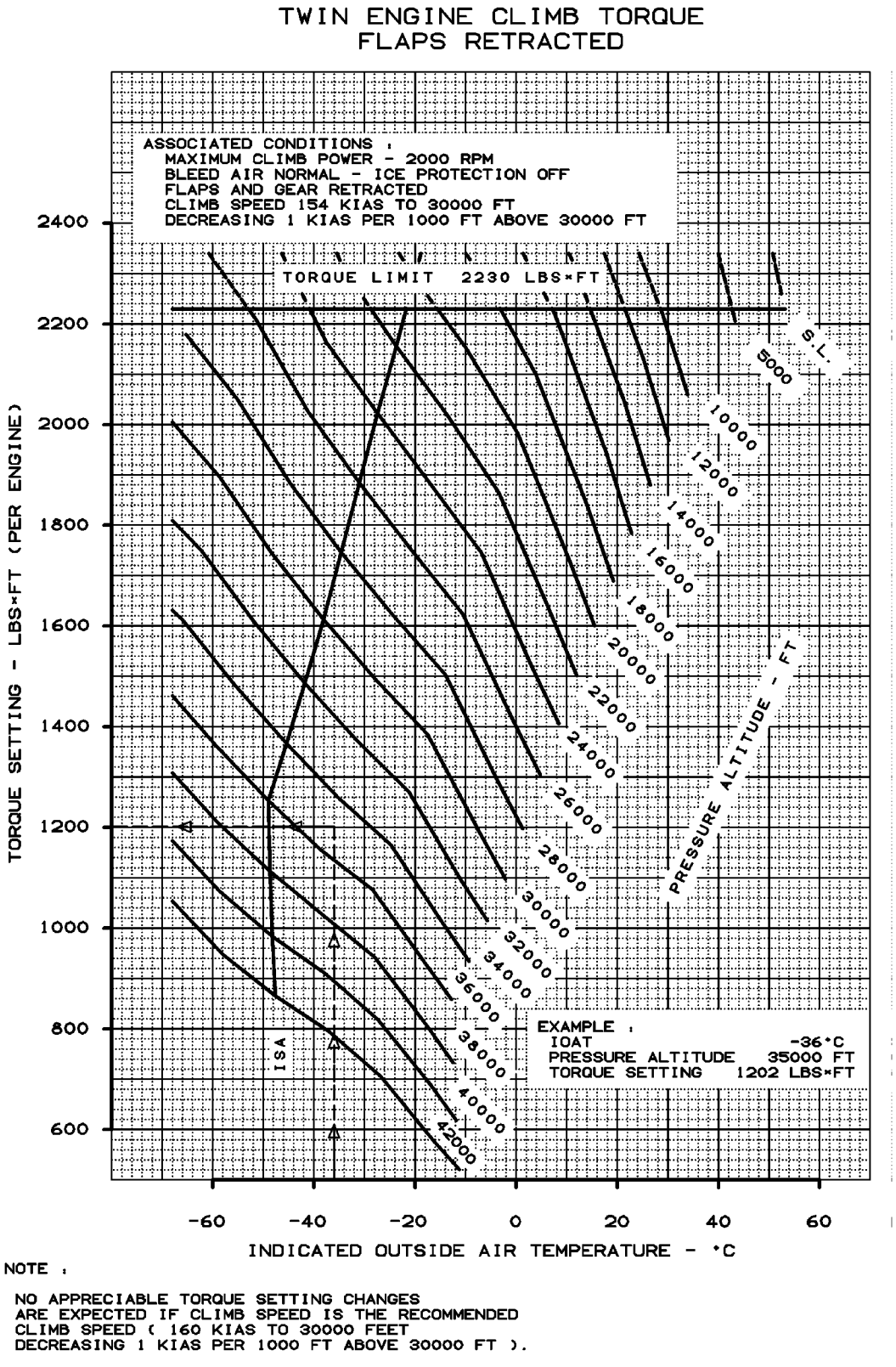


Figure 5-25. TWIN ENGINE CLIMB FUEL FLOW - FLAPS MID



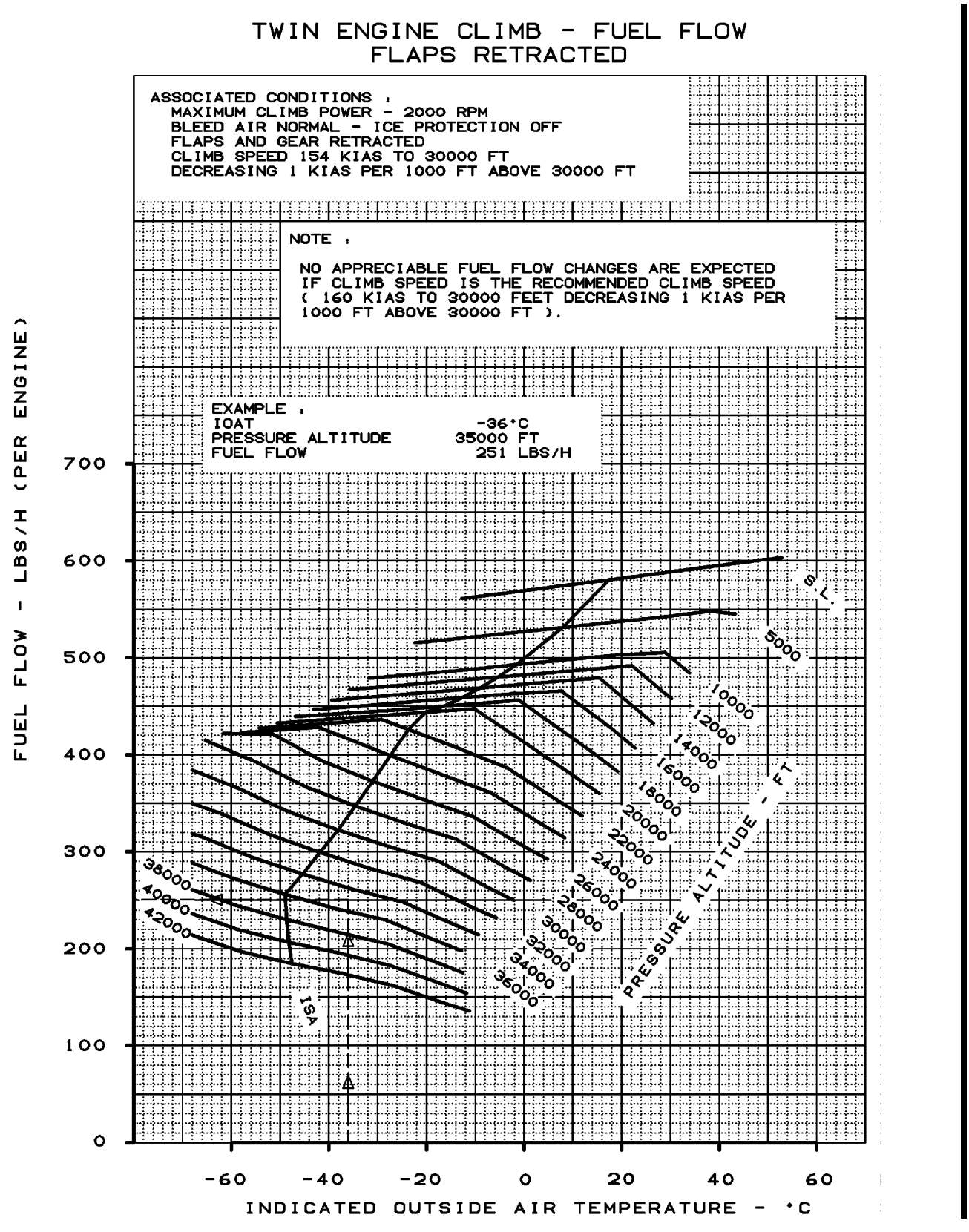
FM_5_26

Figure 5-26. TWIN ENGINE CLIMB - FLAPS MID



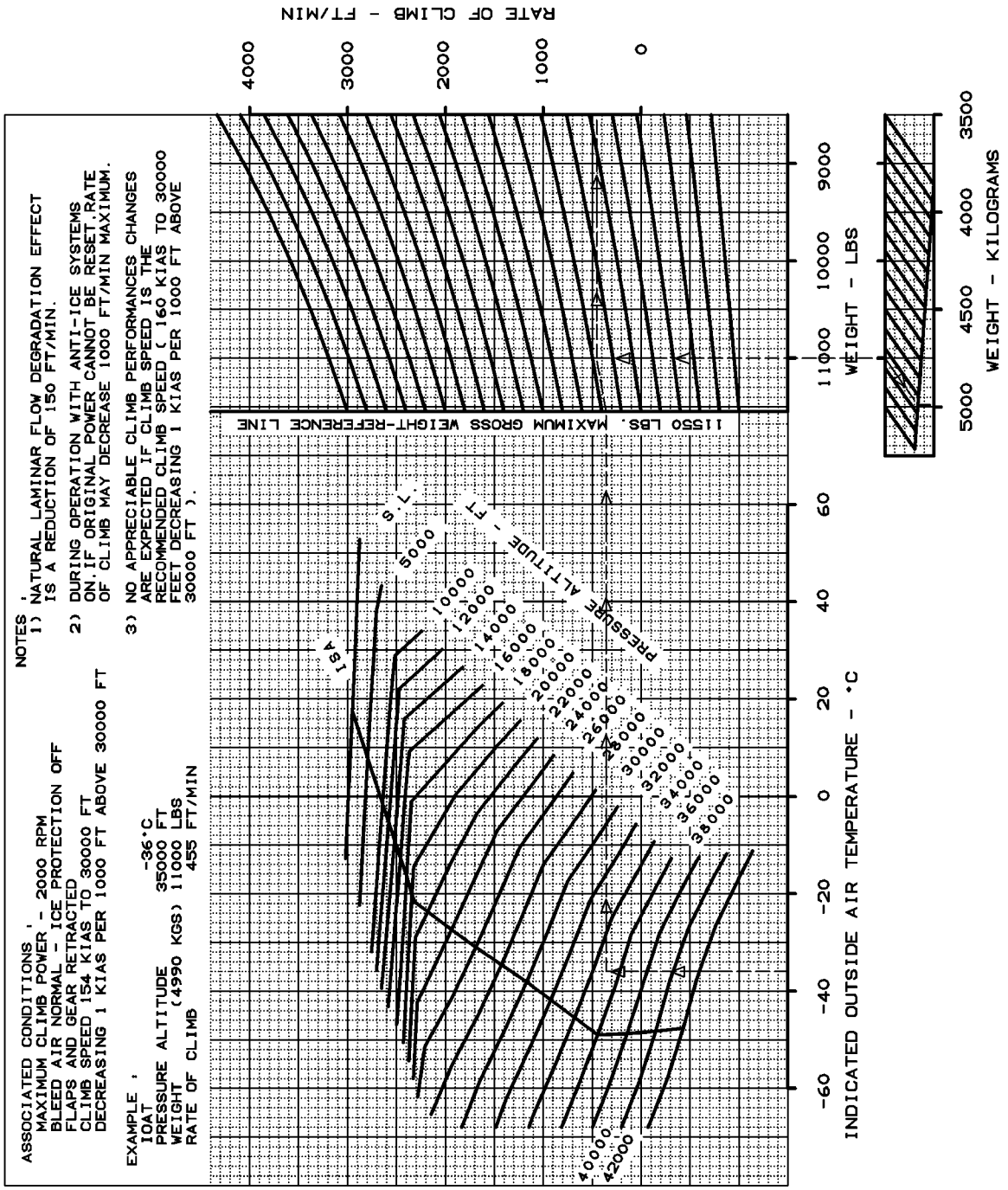
FM_5_27

Figure 5-27. TWIN ENGINE CLIMB TORQUE - FLAPS RETRACTED



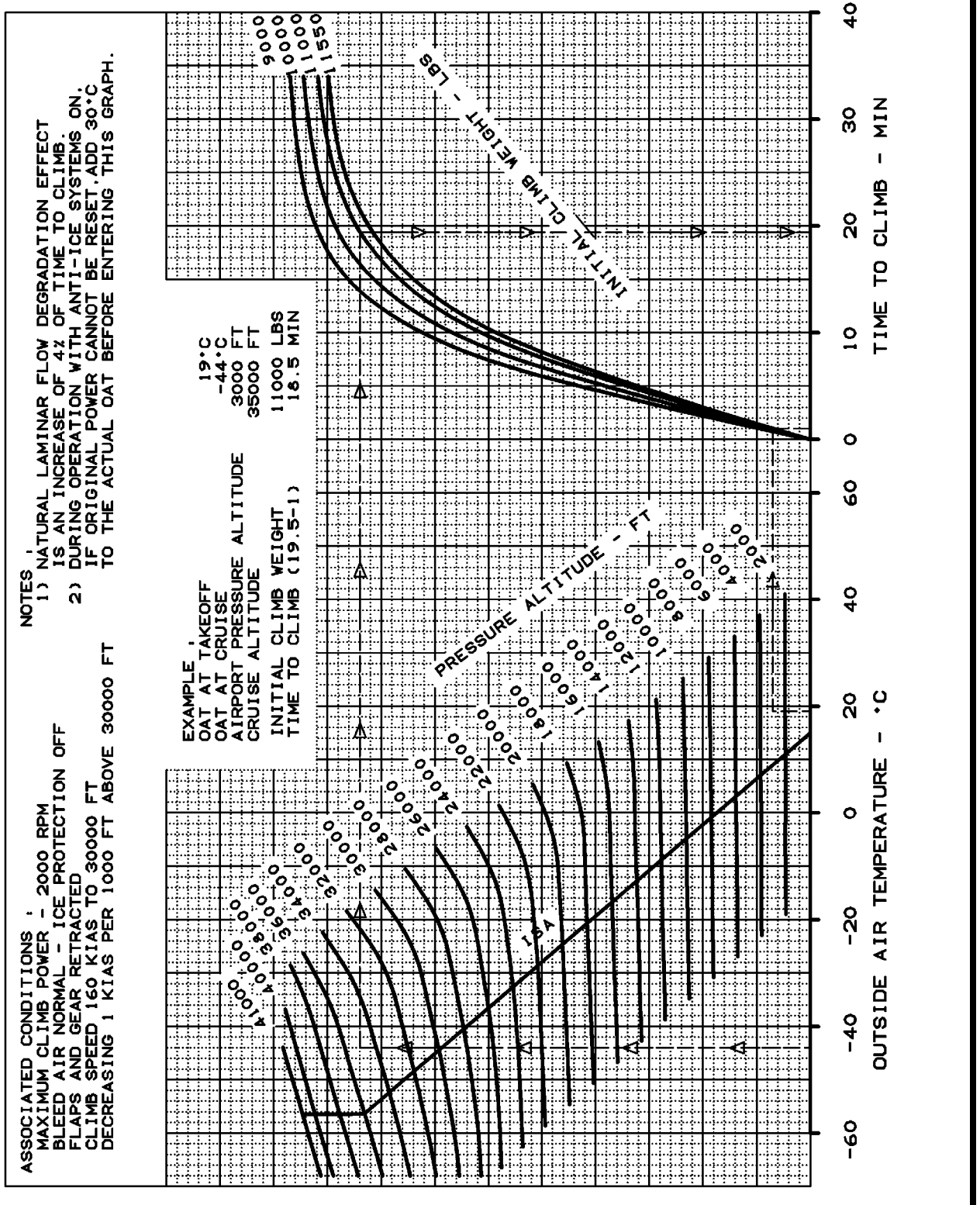
FM_5_28

Figure 5-28. TWIN ENGINE CLIMB FUEL FLOW - FLAPS RETRACTED



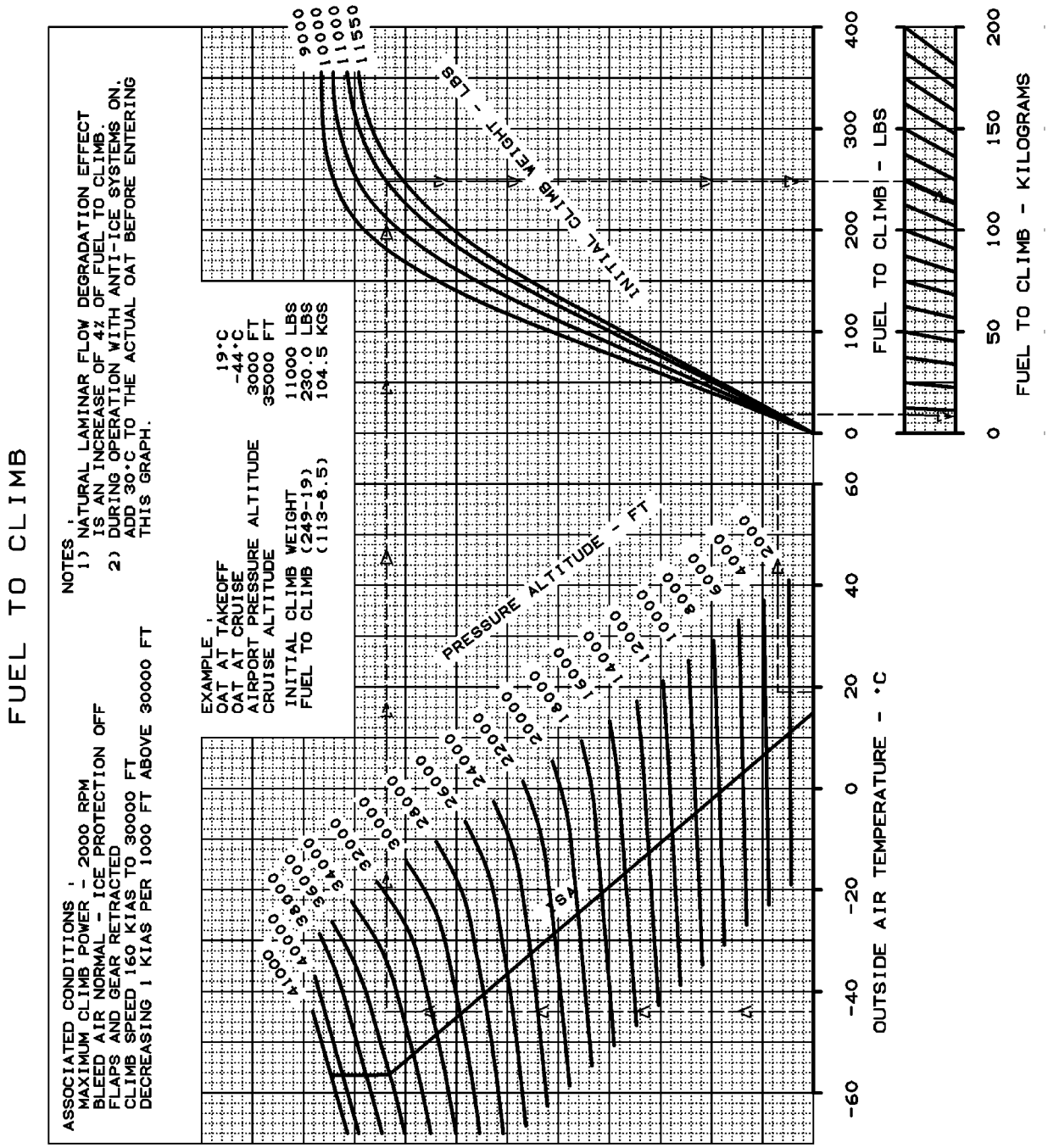
FM_5_29

Figure 5-29. TWIN ENGINE CLIMB - FLAPS RETRACTED



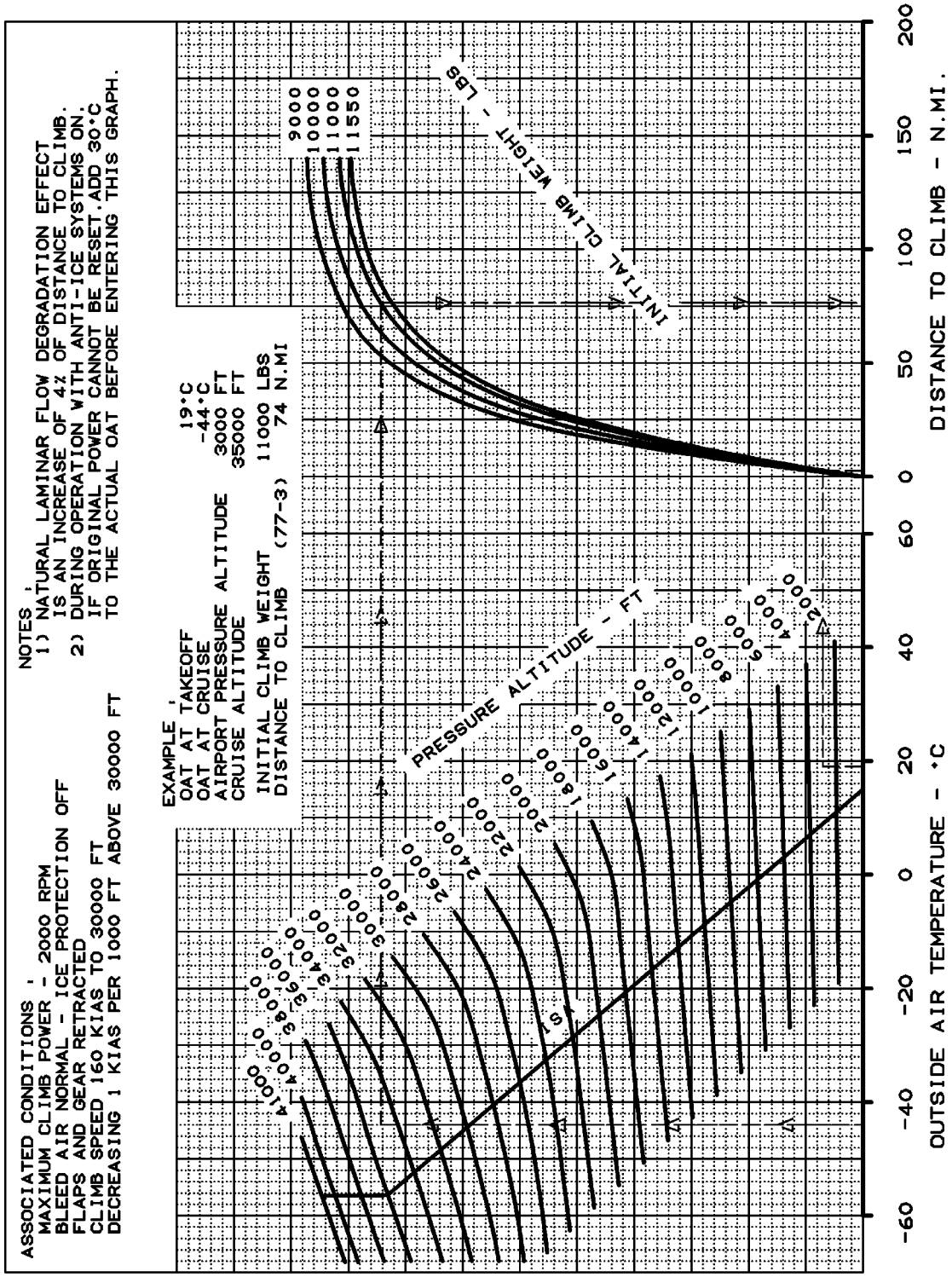
FM_5_30

Figure 5-30. TIME TO CLIMB



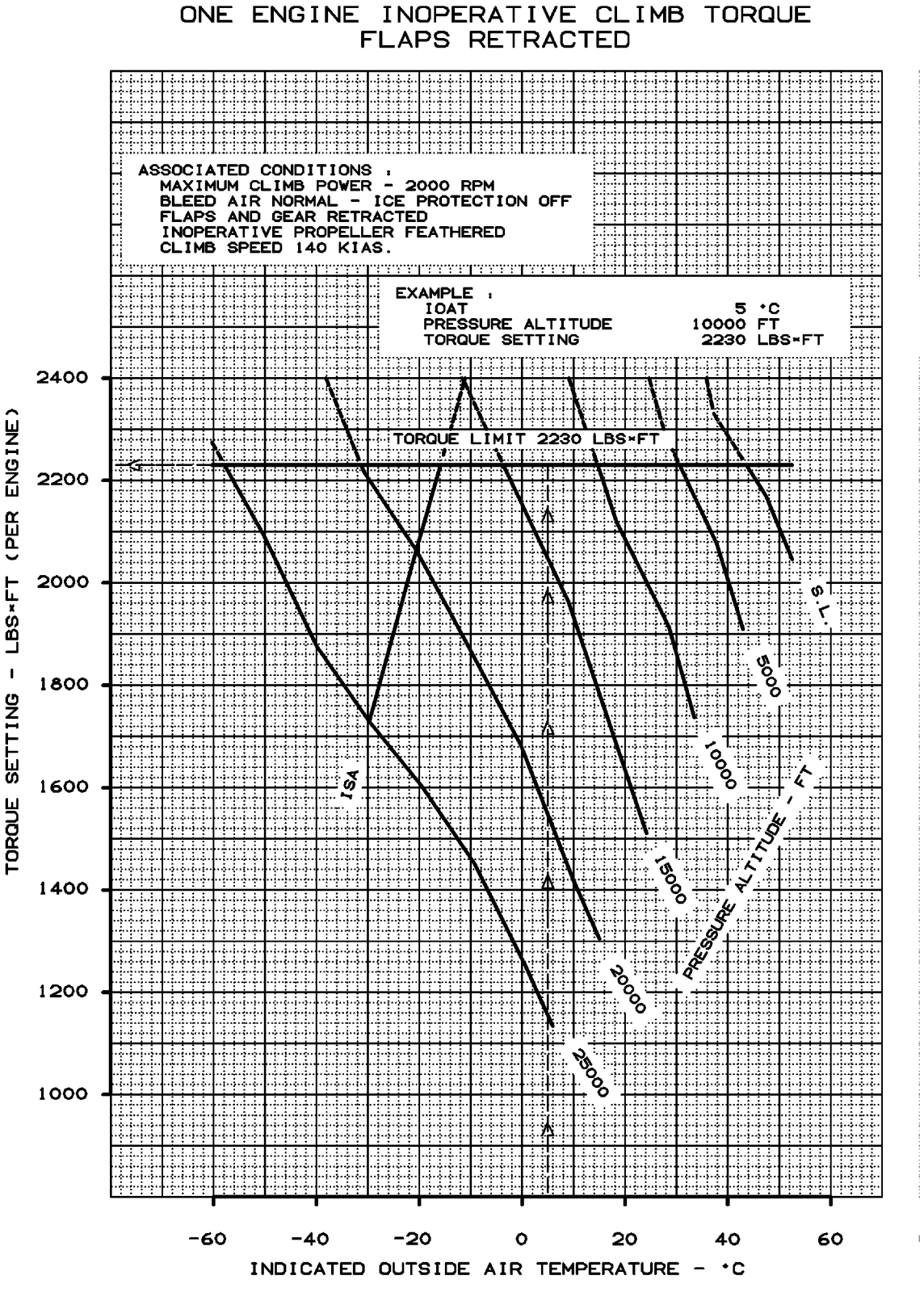
FM_5_31

Figure 5-31. FUEL TO CLIMB



FM_5_32

Figure 5-32. DISTANCE TO CLIMB



FM_5_33

Figure 5-33. ONE ENGINE INOPERATIVE CLIMB TORQUE - FLAPS RETRACTED

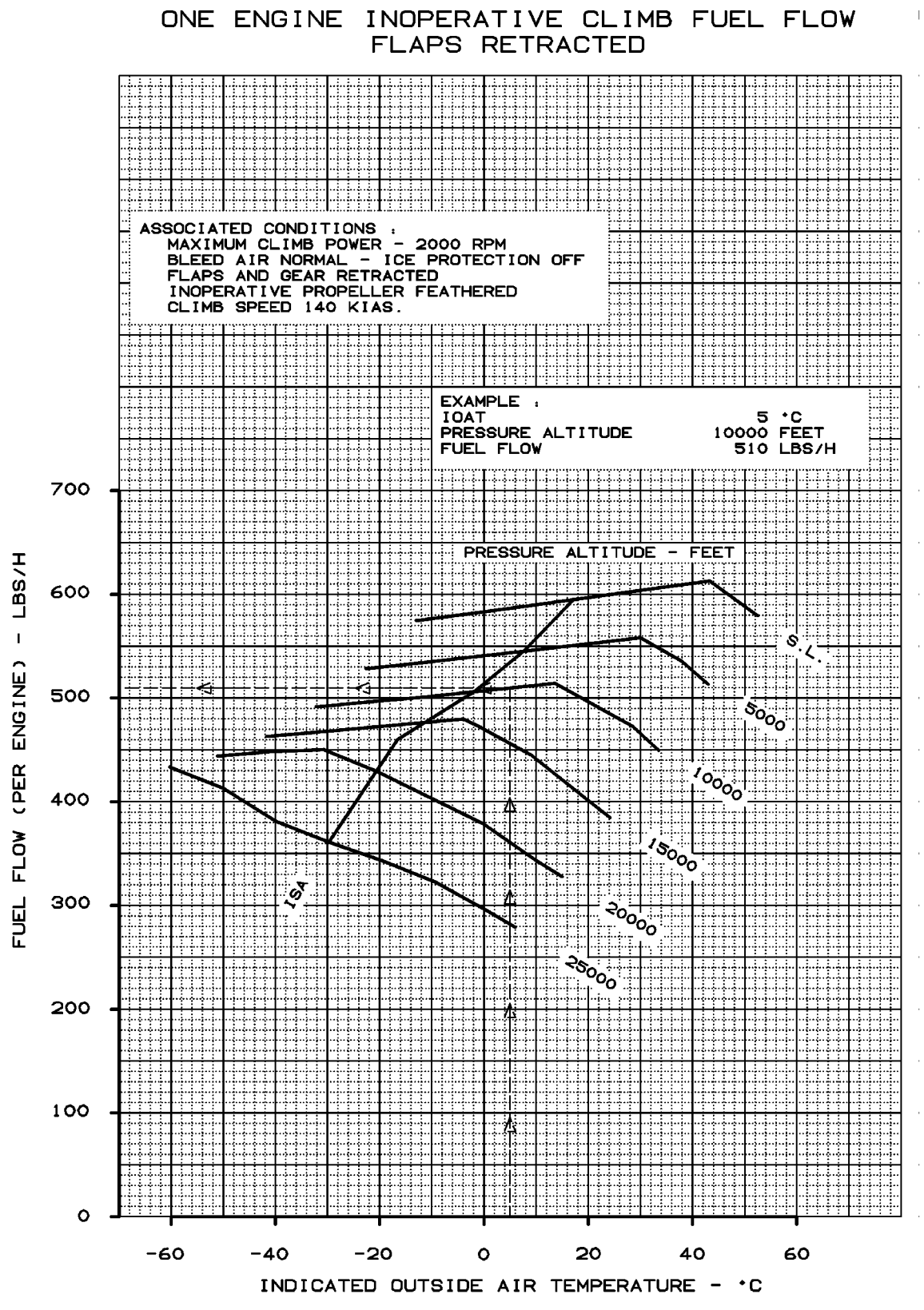
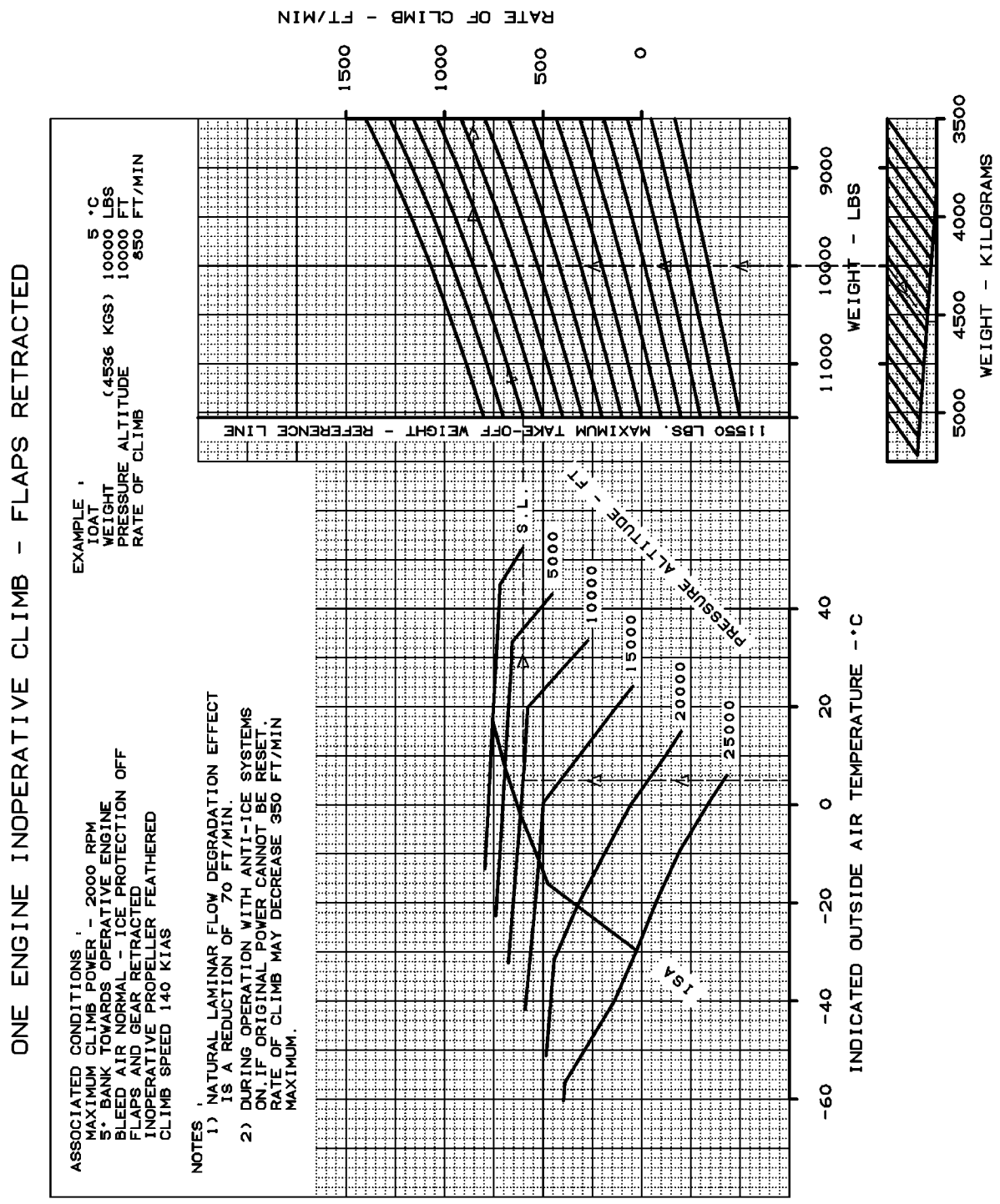
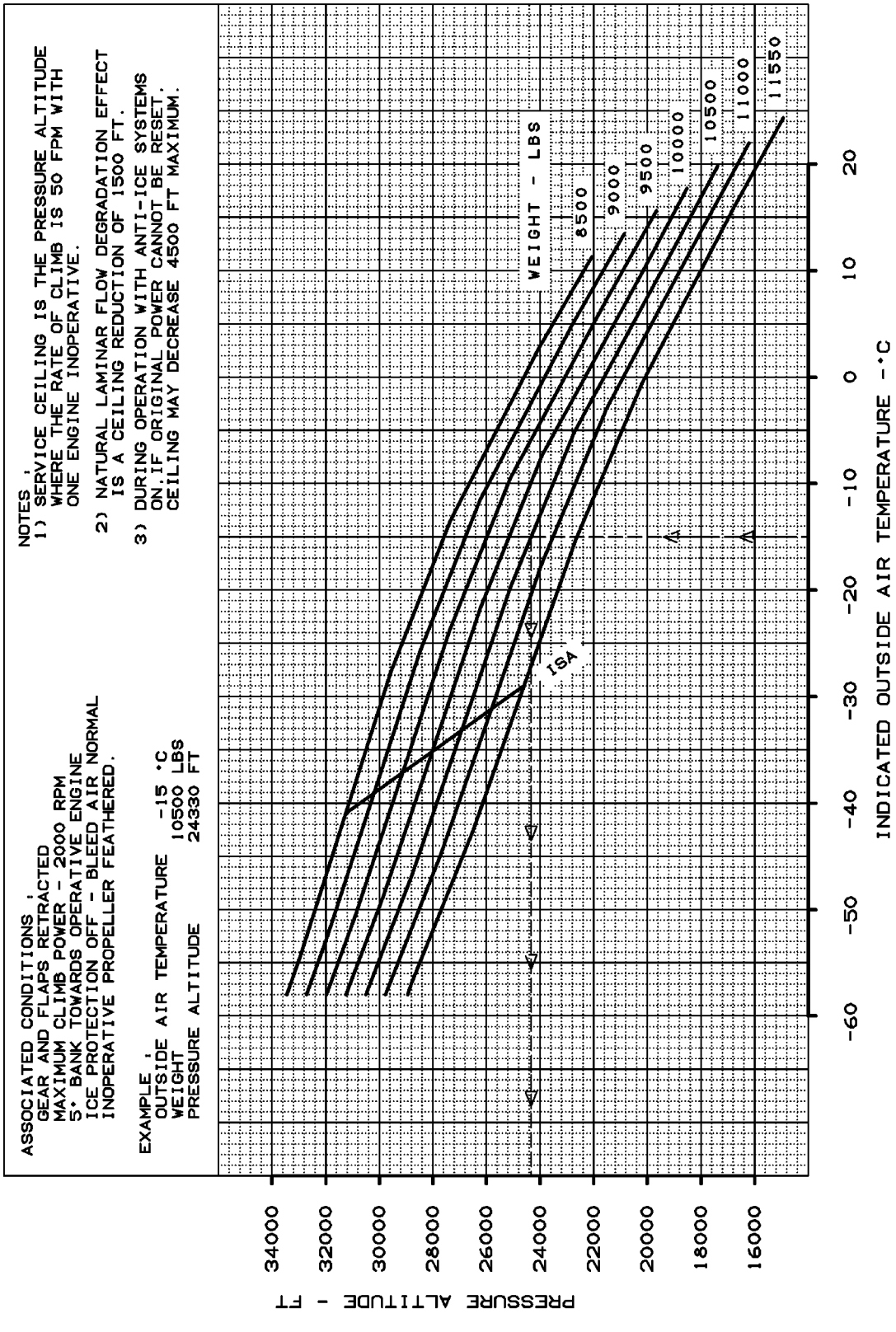


Figure 5-34. ONE ENGINE INOPERATIVE CLIMB FUEL FLOW - FLAPS RETRACTED



FM_5_35

Figure 5-35. ONE ENGINE INOPERATIVE CLIMB - FLAPS RETRACTED



FM_5_36

Figure 5-36. ONE ENGINE INOPERATIVE SERVICE CEILING - FLAPS RETRACTED

INTENTIONALLY LEFT BLANK

PIAGGIO AERO

MAXIMUM CRUISE POWER
2000 RPM
ISA – 30°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS (4990 KG)		10000 LBS (4536 KG)		9000 LBS (4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	-9	15	1450	448	896	244	260	244	260	244	260
5000	-18	-1	1558	418	836	262	260	262	260	262	260
10000	-27	-17	1659	393	786	281	260	281	260	281	260
15000	-36	-33	1759	374	748	302	260	302	260	302	260
20000	-45	-48	1848	362	724	325	260	325	260	325	260
23000	-50	-57	1916	361	722	340	260	340	260	340	260
25000	-53	-63	1973	362	724	350	260	350	260	350	260
27000	-56	-69	2039	368	736	361	260	361	260	361	260
28000	-58	-72	2076	373	746	366	260	366	260	366	260
29000	-60	-75	2034	366	732	367	256	367	256	367	256
31000	-64	-83	1888	342	684	363	245	363	245	363	245
33000	-68	-90	1753	321	642	360	234	360	234	360	234
35000	-72	-98	1629	301	602	356	223	356	223	356	223
37000	-74	-102	1522	284	568	354	213	354	213	354	213
39000	-74	-102	1433	271	542	354	203	354	203	354	203
41000	-74	-102	1353	259	518	354	194	354	194	354	194

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-37. MAXIMUM CRUISE POWER - 2000 RPM - ISA – 30°C

MAXIMUM CRUISE POWER
2000 RPM
ISA – 20°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS (4990 KG)		10000 LBS (4536 KG)		9000 LBS (4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	1	34	1478	454	908	249	260	249	260	249	260
5000	-8	17	1589	425	850	267	260	267	260	267	260
10000	-17	2	1694	401	802	286	260	286	260	286	260
15000	-26	-14	1797	382	764	308	260	308	260	308	260
20000	-34	-29	1890	370	740	332	260	332	260	332	260
23000	-39	-38	1961	370	740	348	260	348	260	348	260
25000	-42	-44	2020	372	744	358	260	358	260	358	260
27000	-45	-50	2088	379	758	370	260	370	260	370	260
28000	-47	-53	2126	384	768	375	260	375	260	375	260
29000	-49	-56	2084	377	754	376	256	376	256	376	256
31000	-53	-64	1936	353	706	373	245	373	245	373	245
33000	-57	-71	1798	331	662	369	234	369	234	369	234
35000	-62	-79	1672	311	622	365	223	365	223	365	223
37000	-64	-83	1563	293	586	363	213	363	213	363	213
39000	-64	-83	1471	279	558	363	203	363	203	363	203
41000	-65	-84	1267	246	492	351	187	357	190	363	194

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-38. MAXIMUM CRUISE POWER - 2000 RPM - ISA – 20°C

PIAGGIO AERO

MAXIMUM CRUISE POWER
2000 RPM
ISA – 10°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS		10000 LBS		9000 LBS	
						(4990 KG)		(4536 KG)		(4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	11	52	1505	460	920	253	260	253	260	253	260
5000	2	36	1619	432	864	272	260	272	260	272	260
10000	-7	20	1728	410	820	292	260	292	260	292	260
15000	-15	5	1834	392	784	315	260	315	260	315	260
20000	-24	-10	1931	381	762	339	260	339	260	339	260
23000	-28	-19	2005	381	762	355	260	355	260	355	260
25000	-32	-25	2066	383	766	366	260	366	260	366	260
27000	-35	-31	2136	391	782	378	260	378	260	378	260
28000	-36	-33	2176	396	792	384	260	384	260	384	260
29000	-38	-37	2133	389	778	385	256	385	256	385	256
31000	-42	-44	1982	364	728	381	245	381	245	381	245
33000	-47	-52	1842	341	682	378	234	378	234	378	234
35000	-51	-60	1691	317	634	373	222	374	223	374	223
37000	-54	-65	1496	285	570	363	207	369	211	373	213
39000	-55	-67	1271	249	498	349	189	355	193	361	197
41000	-56	-69	1084	218	436	-	-	341	176	348	180

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-39. MAXIMUM CRUISE POWER - 2000 RPM - ISA – 10°C

MAXIMUM CRUISE POWER
2000 RPM
ISA

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS		10000 LBS		9000 LBS	
						(4990 KG)		(4536 KG)		(4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	21	70	1532	468	936	258	260	258	260	258	260
5000	12	54	1649	442	884	277	260	277	260	277	260
10000	4	39	1761	419	838	298	260	298	260	298	260
15000	-5	23	1870	401	802	321	260	321	260	321	260
20000	-13	8	1971	391	782	346	260	346	260	346	260
23000	-18	0	2047	391	782	363	260	363	260	363	260
25000	-21	-6	2110	394	788	374	260	374	260	374	260
27000	-24	-12	2183	401	802	386	260	386	260	386	260
28000	-26	-15	2112	390	780	386	255	389	257	392	259
29000	-28	-19	2019	374	748	383	249	386	251	390	253
31000	-33	-27	1843	345	690	377	236	382	239	385	241
33000	-37	-35	1670	318	636	370	223	375	226	380	230
35000	-42	-43	1509	291	582	363	211	368	214	374	217
37000	-45	-48	1320	260	520	351	195	357	199	363	202
39000	-46	-50	1127	228	456	335	177	343	181	350	186
41000	-47	-53	948	199	398	–	–	–	–	335	168

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-40. MAXIMUM CRUISE POWER - 2000 RPM - ISA

PIAGGIO AERO

MAXIMUM CRUISE POWER
2000 RPM
ISA + 10°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS (4990 KG)		10000 LBS (4536 KG)		9000 LBS (4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	32	89	1558	477	954	262	260	262	260	262	260
5000	23	73	1678	452	904	282	260	282	260	282	260
10000	14	57	1793	430	860	303	260	303	260	303	260
15000	6	42	1906	413	826	327	260	327	260	327	260
20000	-3	27	2010	401	802	353	260	353	260	353	260
23000	-7	19	2089	401	802	370	260	370	260	370	260
25000	-11	13	2154	403	806	382	260	382	260	382	260
27000	-15	6	2017	379	758	381	250	384	252	387	254
28000	-17	2	1929	364	728	379	244	382	246	385	248
29000	-19	-2	1841	350	700	376	238	379	240	383	243
31000	-23	-10	1671	322	644	369	225	374	229	378	231
33000	-28	-18	1506	295	590	361	212	367	216	372	219
35000	-33	-27	1344	268	536	351	198	358	202	364	206
37000	-36	-32	1178	240	480	338	183	346	187	353	191
39000	-37	-34	1000	210	420	–	–	329	169	338	174
41000	–	–	–	–	–	–	–	–	–	–	–

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-41. MAXIMUM CRUISE POWER - 2000 RPM - ISA + 10°C

MAXIMUM CRUISE POWER
2000 RPM
ISA + 20°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS		10000 LBS		9000 LBS	
						(4990 KG)		(4536 KG)		(4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	42	107	1584	489	978	267	260	267	260	267	260
5000	33	91	1707	464	928	287	260	287	260	287	260
10000	24	76	1825	441	882	309	260	309	260	309	260
15000	16	61	1941	423	846	333	260	333	260	333	260
20000	8	46	2048	411	822	360	260	360	260	360	260
23000	3	37	2118	408	816	377	259	377	260	377	260
25000	-1	30	1961	378	756	374	248	377	250	379	252
27000	-5	22	1795	350	700	370	237	373	239	376	241
28000	-8	18	1715	336	672	367	231	370	233	374	236
29000	-10	15	1635	323	646	365	225	368	228	371	230
31000	-14	6	1478	296	592	357	212	362	216	366	218
33000	-19	-2	1323	270	540	347	199	353	203	359	206
35000	-24	-10	1186	247	494	336	185	344	190	351	194
37000	-27	-16	1042	221	442	319	168	331	174	340	180
39000	-28	-19	866	192	384	–	–	–	–	317	159
41000	–	–	–	–	–	–	–	–	–	–	–

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-42. MAXIMUM CRUISE POWER - 2000 RPM - ISA + 20°C

PIAGGIO AERO

MAXIMUM CRUISE POWER
2000 RPM
ISA + 30°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS		10000 LBS		9000 LBS	
						(4990 KG)		(4536 KG)		(4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	52	126	1610	500	1000	271	260	271	260	271	260
5000	43	110	1736	475	950	291	260	291	260	291	260
10000	35	94	1857	452	904	314	260	314	260	314	260
15000	26	79	1976	432	864	339	260	339	260	339	260
20000	18	64	1972	402	804	359	254	360	255	361	256
23000	12	53	1783	363	726	357	240	360	242	361	243
25000	7	45	1647	337	674	354	230	357	232	360	234
27000	3	38	1499	311	622	349	218	352	221	356	223
28000	1	34	1425	298	596	345	212	349	215	353	217
29000	-1	30	1351	285	570	341	206	346	209	350	211
31000	-6	21	1203	259	518	329	191	338	196	342	199
33000	-11	12	1080	237	474	315	176	327	183	336	188
35000	-16	3	963	216	432	291	156	314	169	326	176
37000	-18	0	855	195	390	–	–	–	–	306	157
39000	–	–	–	–	–	–	–	–	–	–	–
41000	–	–	–	–	–	–	–	–	–	–	–

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-43. MAXIMUM CRUISE POWER - 2000 RPM - ISA + 30°C

RECOMMENDED CRUISE POWER
1800 RPM
ISA – 30°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS		10000 LBS		9000 LBS	
						(4990 KG)		(4536 KG)		(4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	-9	15	1621	443	886	244	260	244	260	244	260
5000	-18	-1	1752	415	830	262	260	262	260	262	260
10000	-27	-17	1858	390	780	281	260	281	260	281	260
15000	-36	-33	1953	370	740	302	260	302	260	302	260
20000	-45	-48	2047	359	718	325	260	325	260	325	260
23000	-50	-57	2127	359	718	340	260	340	260	340	260
25000	-53	-63	2198	362	724	350	260	350	260	350	260
27000	-56	-69	2230	364	728	358	257	361	260	361	260
28000	-58	-72	2230	364	728	361	255	364	258	366	260
29000	-60	-76	2230	363	726	364	253	367	256	367	256
31000	-64	-83	2102	344	688	363	245	363	245	363	245
33000	-68	-90	1929	319	638	360	234	360	234	360	234
35000	-72	-98	1770	296	592	356	223	356	223	356	223
37000	-74	-102	1633	276	552	354	213	354	213	354	213
39000	-74	-102	1517	260	520	354	203	354	203	354	203
41000	-74	-102	1411	245	490	354	194	354	194	354	194

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-44. RECOMMENDED CRUISE POWER - 1800 RPM - ISA – 30°C

PIAGGIO AERO

RECOMMENDED CRUISE POWER
1800 RPM
ISA – 20°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS (4990 KG)		10000 LBS (4536 KG)		9000 LBS (4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	1	34	1652	449	898	249	260	249	260	249	260
5000	-8	17	1786	422	844	267	260	267	260	267	260
10000	-17	2	1896	398	796	286	260	286	260	286	260
15000	-26	-14	1995	379	758	308	260	308	260	308	260
20000	-34	-29	2094	368	736	332	260	332	260	332	260
23000	-39	-38	2177	369	738	348	260	348	260	348	260
25000	-42	-44	2230	371	742	357	259	358	260	358	260
27000	-46	-50	2230	368	736	364	255	367	257	370	260
28000	-48	-54	2230	368	736	367	253	370	256	373	258
29000	-49	-57	2230	367	734	370	251	373	254	376	256
31000	-53	-64	2155	356	712	373	245	373	245	373	245
33000	-57	-71	1979	330	660	369	234	369	234	369	234
35000	-62	-79	1817	306	612	365	223	365	223	365	223
37000	-64	-83	1676	285	570	363	213	363	213	363	213
39000	-64	-83	1543	267	534	362	202	363	203	363	203
41000	-65	-86	1317	234	468	342	182	352	187	358	191

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-45. RECOMMENDED CRUISE POWER - 1800 RPM - ISA – 20°C

RECOMMENDED CRUISE POWER
1800 RPM
ISA – 10°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS (4990 KG)		10000 LBS (4536 KG)		9000 LBS (4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	11	52	1682	454	908	253	260	253	260	253	260
5000	2	36	1821	429	858	272	260	272	260	272	260
10000	-7	20	1934	407	814	292	260	292	260	292	260
15000	-15	5	2036	389	778	315	260	315	260	315	260
20000	-24	-10	2139	379	758	339	260	339	260	339	260
23000	-28	-19	2225	381	762	355	260	355	260	355	260
25000	-32	-25	2230	375	750	362	257	365	259	366	260
27000	-35	-32	2230	373	746	369	253	372	255	375	258
28000	-37	-35	2230	372	744	372	251	375	253	379	256
29000	-39	-38	2230	371	742	375	249	379	251	382	254
31000	-43	-45	2116	354	708	376	241	379	243	381	245
33000	-47	-53	1934	327	654	371	229	375	232	378	234
35000	-52	-61	1759	301	602	365	218	370	220	373	223
37000	-54	-66	1553	271	542	355	202	361	206	366	209
39000	-56	-68	1320	237	474	334	181	344	187	352	191
41000	-57	-71	1121	207	414	–	–	324	167	336	174

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-46. RECOMMENDED CRUISE POWER - 1800 RPM - ISA – 10°C

PIAGGIO AERO

RECOMMENDED CRUISE POWER
1800 RPM
ISA

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS (4990 KG)		10000 LBS (4536 KG)		9000 LBS (4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	21	70	1712	462	924	258	260	258	260	258	260
5000	12	54	1854	439	878	277	260	277	260	277	260
10000	4	39	1971	417	834	298	260	298	260	298	260
15000	-5	23	2077	399	798	321	260	321	260	321	260
20000	-13	8	2183	389	778	346	260	346	260	346	260
23000	-18	-1	2230	386	772	360	258	363	260	363	260
25000	-22	-7	2230	380	760	367	254	370	257	373	258
27000	-25	-13	2230	377	754	374	251	377	253	381	256
28000	-27	-17	2196	371	742	375	247	379	250	383	253
29000	-29	-20	2100	357	714	373	241	377	244	381	247
31000	-33	-28	1915	329	658	367	229	371	232	376	235
33000	-38	-36	1737	303	606	360	216	365	220	370	223
35000	-43	-45	1566	277	554	351	203	358	207	364	211
37000	-46	-50	1370	248	496	336	186	346	192	353	196
39000	-47	-53	1166	217	434	312	164	326	172	338	178
41000	-49	-57	972	188	376	–	–	–	–	316	158

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-47. RECOMMENDED CRUISE POWER - 1800 RPM - ISA

RECOMMENDED CRUISE POWER
1800 RPM
ISA + 10°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS (4990 KG)		10000 LBS (4536 KG)		9000 LBS (4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	32	89	1742	472	944	262	260	262	260	262	260
5000	23	73	1887	450	900	282	260	282	260	282	260
10000	14	57	2008	428	856	303	260	303	260	303	260
15000	6	42	2117	410	820	327	260	327	260	327	260
20000	-3	27	2227	400	800	353	260	353	260	353	260
23000	-8	18	2230	390	780	365	256	368	258	369	259
25000	-11	12	2230	383	766	372	252	375	255	378	256
27000	-15	4	2100	363	726	371	243	375	246	379	248
28000	-17	1	2007	349	698	368	237	372	240	376	243
29000	-20	-3	1915	335	670	366	231	370	234	374	237
31000	-24	-11	1735	307	614	358	218	364	222	368	225
33000	-29	-20	1559	281	562	348	204	355	209	362	213
35000	-34	-28	1388	255	510	335	189	345	194	353	199
37000	-37	-34	1219	229	458	317	171	330	178	341	184
39000	-39	-38	1026	199	398	–	–	306	157	322	165
41000	–	–	–	–	–	–	–	–	–	–	–

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-48. RECOMMENDED CRUISE POWER - 1800 RPM - ISA + 10°C

PIAGGIO AERO

RECOMMENDED CRUISE POWER
1800 RPM
ISA + 20°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS		10000 LBS		9000 LBS	
						(4990 KG)		(4536 KG)		(4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	32	89	1742	472	944	262	260	262	260	262	260
5000	23	73	1887	450	900	282	260	282	260	282	260
10000	14	57	2008	428	856	303	260	303	260	303	260
15000	6	42	2117	410	820	327	260	327	260	327	260
20000	-3	27	2227	400	800	353	260	353	260	353	260
23000	-8	18	2230	390	780	365	256	368	258	369	259
25000	-11	12	2230	383	766	372	252	375	255	378	256
27000	-15	4	2100	363	726	371	243	375	246	379	248
28000	-17	1	2007	349	698	368	237	372	240	376	243
29000	-20	-3	1915	335	670	366	231	370	234	374	237
31000	-24	-11	1735	307	614	358	218	364	222	368	225
33000	-29	-20	1559	281	562	348	204	355	209	362	213
35000	-34	-28	1388	255	510	335	189	345	194	353	199
37000	-37	-34	1219	229	458	317	171	330	178	341	184
39000	-39	-38	1026	199	398	–	–	306	157	322	165
41000	–	–	–	–	–	–	–	–	–	–	–

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-49. RECOMMENDED CRUISE POWER - 1800 RPM - ISA + 20°C

RECOMMENDED CRUISE POWER
1800 RPM
ISA + 30°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS (4990 KG)		10000 LBS (4536 KG)		9000 LBS (4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	52	126	1799	496	992	271	260	271	260	271	260
5000	43	110	1952	474	948	291	260	291	260	291	260
10000	35	94	2078	451	902	314	260	314	260	314	260
15000	26	79	2194	431	862	339	260	339	260	339	260
20000	17	63	2086	390	780	352	249	354	250	356	252
23000	11	52	1883	352	704	350	235	353	237	355	239
25000	7	45	1738	327	654	346	225	350	227	353	229
27000	3	37	1580	301	602	340	213	344	216	349	218
28000	0	33	1501	288	576	337	207	341	210	346	212
29000	-2	29	1422	276	552	332	200	337	204	342	207
31000	-7	20	1266	251	502	317	184	329	191	334	194
33000	-12	11	1140	229	458	300	167	316	176	328	184
35000	-17	2	1016	209	418	278	149	299	160	316	170
37000	-21	-6	861	184	368	–	–	–	–	293	151
39000	–	–	–	–	–	–	–	–	–	–	–
41000	–	–	–	–	–	–	–	–	–	–	–

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 5-50. RECOMMENDED CRUISE POWER - 1800 RPM - ISA + 30°C

MAXIMUM RANGE POWER
2000 RPM
ISA – 30°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	-10	14	1330	433	237	251	1253	424	233	248	1177	414	230	245
5000	-20	-3	1271	383	242	240	1199	374	239	237	1127	365	236	233
10000	-29	-21	1209	338	248	229	1136	329	245	226	1068	321	241	222
15000	-39	-38	1146	298	254	218	1077	290	250	214	1007	282	247	211
20000	-49	-55	1072	263	260	206	1009	255	256	203	945	248	252	200
23000	-54	-66	1040	246	264	200	964	237	260	196	904	230	256	193
25000	-58	-73	1020	235	267	195	946	226	262	192	875	217	258	189
27000	-62	-80	996	225	269	191	926	216	265	187	854	207	260	184
28000	-64	-83	984	221	271	189	915	212	266	185	845	203	262	182
29000	-66	-87	973	216	272	186	904	207	267	183	835	198	263	180
31000	-70	-93	967	210	275	182	880	198	270	179	814	189	265	175
33000	-74	-100	956	204	277	177	873	192	272	174	790	181	267	171
35000	-77	-107	942	198	280	173	863	186	275	170	782	175	270	166
37000	-79	-111	930	193	284	168	853	181	279	165	775	170	273	162
39000	-79	-110	920	189	290	164	845	178	284	161	769	166	278	157
41000	-79	-110	909	186	295	160	834	174	289	156	760	163	283	153

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-51. MAXIMUM RANGE POWER - 2000 RPM - ISA – 30°C

MAXIMUM RANGE POWER
2000 RPM
ISA – 20°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	0	32	1296	431	237	247	1219	421	234	244	1142	411	231	240
5000	-10	15	1248	382	243	237	1175	372	240	233	1102	363	237	230
10000	-19	-2	1195	338	250	226	1121	329	246	223	1053	321	243	219
15000	-29	-20	1142	300	257	215	1071	291	253	212	1000	282	249	209
20000	-38	-37	1076	266	264	205	1011	258	260	201	946	250	256	198
23000	-44	-47	1049	250	269	198	971	240	264	195	909	232	260	192
25000	-48	-54	1032	239	272	194	956	230	267	191	883	220	262	187
27000	-52	-61	1011	230	275	190	939	221	270	186	865	211	265	183
28000	-54	-65	999	225	276	188	929	216	271	184	857	207	267	181
29000	-56	-68	990	221	278	186	919	212	273	182	849	202	268	179
31000	-59	-75	987	216	281	181	897	203	276	178	829	194	271	175
33000	-63	-82	979	210	284	177	893	198	279	174	807	186	274	170
35000	-67	-89	966	204	287	173	885	192	282	170	801	180	277	166
37000	-69	-92	956	199	292	169	877	187	286	165	796	176	281	162
39000	-69	-92	948	196	298	164	870	184	292	161	792	172	286	158
41000	-68	-91	938	192	304	160	861	180	298	157	785	168	292	153

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-52. MAXIMUM RANGE POWER - 2000 RPM - ISA – 20°C

MAXIMUM RANGE POWER
2000 RPM
ISA – 10°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	10	50	1236	422	236	241	1155	411	232	237	1075	400	228	234
5000	0	33	1202	378	243	231	1126	368	239	228	1050	358	235	224
10000	-9	15	1165	337	250	222	1087	327	246	218	1015	318	242	214
15000	-19	-2	1125	300	258	212	1051	291	254	208	976	281	250	205
20000	-28	-19	1071	268	267	202	1003	259	262	199	935	251	257	195
23000	-34	-29	1052	253	272	196	969	242	267	193	904	234	262	189
25000	-38	-36	1040	242	275	192	959	232	271	189	882	222	266	185
27000	-42	-43	1023	234	279	189	947	224	274	185	869	213	269	181
28000	-43	-46	1013	230	281	187	939	220	276	183	863	210	271	179
29000	-45	-50	1006	226	283	185	930	215	278	181	857	206	272	178
31000	-49	-56	1006	221	287	181	912	208	281	177	841	198	276	174
33000	-53	-63	1001	216	291	177	912	203	285	173	822	190	279	170
35000	-57	-70	992	210	295	173	907	198	289	170	820	185	283	166
37000	-59	-73	985	206	300	169	902	193	294	166	818	181	288	162
39000	-58	-73	980	203	307	165	898	190	301	162	816	177	295	158
41000	-58	-72	–	–	–	–	892	187	308	158	812	174	301	154

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-53. MAXIMUM RANGE POWER - 2000 RPM - ISA – 10°C

MAXIMUM RANGE POWER
2000 RPM
ISA

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	20	68	1181	416	234	235	1098	404	230	231	1015	391	226	228
5000	10	51	1160	374	242	226	1080	363	238	222	1001	352	234	219
10000	1	33	1134	335	250	217	1052	324	246	213	977	315	241	210
15000	-9	16	1107	301	259	208	1028	291	254	204	949	280	250	201
20000	-18	-1	1063	270	268	199	991	260	263	195	919	251	258	192
23000	-24	-11	1050	256	274	194	963	244	269	190	894	235	264	186
25000	-28	-18	1042	246	279	190	957	235	273	187	876	224	268	183
27000	-31	-25	1029	238	283	187	949	227	277	183	866	216	272	179
28000	-33	-28	1021	234	285	185	943	223	279	181	863	212	274	177
29000	-35	-31	1015	230	287	183	936	219	281	179	858	208	276	176
31000	-39	-38	1019	225	292	180	921	211	286	176	845	201	280	172
33000	-43	-45	1017	220	296	176	924	207	290	172	829	193	284	168
35000	-46	-51	1011	215	301	173	922	202	294	169	830	189	288	165
37000	-48	-55	1006	211	307	169	919	198	300	165	831	185	294	161
39000	-48	-54	1004	209	315	165	918	195	308	162	832	182	301	158
41000	-47	-53	–	–	–	–	–	–	–	–	830	180	308	154

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-54. MAXIMUM RANGE POWER - 2000 RPM - ISA

MAXIMUM RANGE POWER
2000 RPM
ISA + 10°C

			11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	30	86	1121	409	232	229	1035	396	227	225	950	382	223	221
5000	20	68	1113	370	240	221	1030	357	236	217	948	345	231	212
10000	11	51	1101	334	249	213	1015	322	245	209	937	310	240	204
15000	1	34	1086	301	259	205	1004	290	254	200	920	279	249	196
20000	-8	17	1054	272	270	197	978	261	265	192	902	251	259	188
23000	-14	7	1049	258	277	192	956	246	271	188	884	236	265	183
25000	-18	0	1045	250	282	189	956	237	276	184	869	226	270	180
27000	-21	-6	1036	242	286	185	952	230	280	181	864	218	274	177
28000	-23	-10	1030	238	289	184	948	227	283	180	863	215	276	175
29000	-25	-13	1026	235	291	182	942	223	285	178	860	211	279	174
31000	-29	-20	1034	230	297	179	931	216	290	175	851	204	283	171
33000	-32	-26	1036	226	302	176	938	212	295	172	839	197	288	167
35000	-36	-33	1033	221	307	172	939	207	300	168	843	193	293	164
37000	-38	-36	1031	218	314	169	939	204	307	165	847	190	300	161
39000	-37	-35	–	–	–	–	941	201	315	162	851	187	308	158
41000	–	–	–	–	–	–	–	–	–	–	–	–	–	–

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-55. MAXIMUM RANGE POWER - 2000 RPM - ISA + 10°C

MAXIMUM RANGE POWER
2000 RPM
ISA + 20°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	40	103	1053	402	228	222	965	387	224	217	878	372	219	213
5000	30	86	1059	365	238	215	975	352	233	210	891	338	228	206
10000	21	69	1062	332	248	208	973	319	243	203	893	307	238	199
15000	11	52	1063	302	259	201	977	290	254	196	891	278	248	192
20000	2	35	1044	274	271	194	965	263	265	189	886	252	259	185
23000	-4	25	1048	262	279	190	951	248	273	185	875	238	267	181
25000	-7	19	1050	254	285	187	956	241	278	182	865	228	272	178
27000	-11	12	1045	247	290	184	957	234	284	180	865	221	277	175
28000	-13	9	1041	243	293	183	955	231	286	178	867	218	280	174
29000	-15	5	1039	240	296	181	952	227	289	177	866	215	282	173
31000	-18	-1	1052	236	302	179	945	220	295	174	862	208	288	170
33000	-22	-8	1058	232	308	176	956	217	301	171	853	202	294	167
35000	-26	-14	1060	228	315	173	961	213	307	169	862	198	300	164
37000	-27	-17	1033	220	317	167	966	210	315	166	869	195	307	161
39000	-27	-16	–	–	–	–	–	–	–	–	877	193	316	159
41000	–	–	–	–	–	–	–	–	–	–	–	–	–	–

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-56. MAXIMUM RANGE POWER - 2000 RPM - ISA + 20°C

MAXIMUM RANGE POWER
2000 RPM
ISA + 30°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	50	121	1018	402	227	217	928	386	222	212	840	369	217	208
5000	40	104	1032	366	237	211	945	351	232	206	860	337	227	201
10000	31	87	1043	334	248	204	951	319	243	200	869	306	237	195
15000	21	70	1052	305	260	198	963	292	254	193	874	279	248	189
20000	12	53	1041	279	273	192	959	267	267	187	877	255	261	182
23000	6	43	1050	267	282	188	948	252	275	183	870	241	269	179
25000	3	37	1055	259	288	185	957	245	281	181	863	232	274	176
27000	-1	30	1053	252	294	183	962	239	287	178	866	226	280	174
28000	-3	27	1050	248	297	181	961	236	290	177	869	223	283	172
29000	-5	24	1050	245	300	180	960	232	293	176	870	220	286	171
31000	-8	17	1065	241	307	178	955	225	299	173	868	213	292	169
33000	-12	11	1074	236	314	175	969	221	306	171	862	206	298	166
35000	-15	4	958	215	289	155	976	217	313	168	873	202	305	163
37000	-18	0	–	–	–	–	–	–	–	–	847	194	304	156
39000	–	–	–	–	–	–	–	–	–	–	–	–	–	–
41000	–	–	–	–	–	–	–	–	–	–	–	–	–	–

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-57. MAXIMUM RANGE POWER - 2000 RPM - ISA + 30°C

MAXIMUM RANGE POWER
1800 RPM
ISA – 30°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	-10	14	1518	432	238	253	1429	422	236	250	1339	412	233	247
5000	-20	-3	1452	382	243	241	1368	373	240	238	1284	364	237	235
10000	-29	-21	1370	336	248	229	1295	328	245	226	1217	320	242	223
15000	-39	-38	1276	295	253	217	1207	287	250	214	1137	279	246	211
20000	-49	-55	1176	258	258	205	1112	251	255	202	1048	244	251	199
23000	-54	-66	1134	241	261	197	1053	232	257	194	993	225	254	191
25000	-58	-73	1110	230	263	193	1030	221	259	190	955	212	255	187
27000	-62	-80	1081	220	265	188	1006	211	261	185	929	202	257	182
28000	-64	-83	1066	215	266	185	993	206	262	182	918	198	258	179
29000	-66	-87	1054	211	267	183	979	202	263	180	906	193	259	177
31000	-70	-94	1052	205	269	178	951	193	265	175	880	184	261	172
33000	-74	-101	1048	200	271	173	949	188	267	170	852	176	262	167
35000	-78	-108	1042	196	273	168	944	183	268	165	846	170	264	162
37000	-80	-111	1039	193	276	164	942	179	271	161	845	167	267	158
39000	-79	-111	1037	191	281	159	942	177	276	156	846	164	271	153
41000	-79	-111	1032	189	285	154	939	175	280	151	845	162	275	148

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-58. MAXIMUM RANGE POWER - 1800 RPM - ISA – 30°C

MAXIMUM RANGE POWER
1800 RPM
ISA – 20°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	0	32	1470	428	238	249	1376	417	235	245	1282	406	232	242
5000	-10	15	1418	380	244	237	1329	370	241	234	1240	360	237	230
10000	-19	-3	1350	336	250	226	1269	327	246	222	1186	318	242	219
15000	-29	-20	1267	296	255	214	1193	288	252	211	1119	280	248	207
20000	-38	-37	1176	261	261	203	1108	253	257	199	1040	246	253	196
23000	-44	-48	1141	244	265	196	1055	235	261	192	990	227	257	189
25000	-48	-55	1120	234	268	191	1036	224	263	188	956	215	259	185
27000	-52	-62	1095	224	270	186	1016	215	265	183	934	205	261	180
28000	-54	-65	1081	220	271	184	1004	211	267	181	924	201	262	178
29000	-56	-68	1071	216	272	182	992	206	268	179	914	197	263	175
31000	-60	-75	1072	211	275	177	967	198	270	174	891	188	265	171
33000	-64	-82	1071	207	277	173	967	193	272	170	865	180	267	166
35000	-67	-89	1068	202	280	168	965	189	275	165	863	175	270	162
37000	-69	-93	1067	200	284	164	966	185	278	160	864	172	273	157
39000	-69	-92	1068	198	289	159	968	183	283	156	868	169	278	153
41000	-69	-92	1065	196	294	155	967	182	288	151	869	168	282	148

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-59. MAXIMUM RANGE POWER - 1800 RPM - ISA – 20°C

MAXIMUM RANGE POWER
1800 RPM
ISA – 10°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	10	50	1395	418	236	242	1303	406	233	239	1211	394	230	236
5000	0	33	1362	375	243	231	1274	365	239	228	1187	354	236	225
10000	-9	15	1311	334	249	221	1231	325	246	218	1149	316	242	214
15000	-19	-2	1243	296	256	210	1170	288	252	207	1097	279	249	204
20000	-28	-19	1166	262	263	200	1099	254	259	196	1031	247	255	193
23000	-34	-29	1140	247	268	193	1052	236	264	190	988	229	259	187
25000	-38	-36	1124	236	271	189	1039	226	266	186	958	217	262	183
27000	-42	-43	1104	228	274	185	1023	218	269	182	940	208	265	179
28000	-44	-47	1092	224	275	183	1014	214	271	180	933	204	266	176
29000	-46	-50	1083	220	277	181	1003	210	272	178	925	200	268	174
31000	-49	-57	1088	216	280	176	982	202	275	173	906	193	271	170
33000	-53	-64	1092	212	283	172	986	198	278	169	883	185	273	166
35000	-57	-71	1093	208	286	168	988	194	281	165	884	181	276	162
37000	-59	-74	1096	206	291	164	992	191	286	161	889	177	280	158
39000	-59	-74	1100	205	297	160	998	190	291	156	896	175	286	153
41000	-58	-73	–	–	–	–	1000	189	297	152	900	174	291	149

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-60. MAXIMUM RANGE POWER - 1800 RPM - ISA – 10°C

MAXIMUM RANGE POWER
1800 RPM
ISA

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	20	68	1321	410	234	235	1230	397	231	232	1138	385	228	229
5000	10	51	1302	370	241	225	1215	358	238	222	1127	347	234	219
10000	1	33	1267	331	248	216	1186	322	245	212	1103	312	241	209
15000	-9	16	1212	295	256	206	1139	287	252	203	1065	278	248	199
20000	-18	-1	1146	263	264	196	1079	255	260	193	1011	247	256	190
23000	-24	-11	1129	248	269	190	1038	237	265	187	974	230	260	184
25000	-28	-18	1118	239	272	186	1031	228	268	183	948	218	264	180
27000	-32	-25	1102	231	276	182	1020	220	271	179	934	210	267	176
28000	-34	-28	1092	227	278	180	1013	217	273	177	930	206	269	174
29000	-35	-32	1085	223	280	178	1004	213	275	175	924	203	270	172
31000	-39	-39	1093	219	283	174	986	205	278	171	908	195	274	168
33000	-43	-45	1100	216	287	170	993	201	282	167	889	188	277	164
35000	-47	-52	1104	212	291	167	998	198	286	163	893	184	281	160
37000	-49	-56	1111	210	296	163	1005	195	291	160	901	181	285	156
39000	-48	-55	1118	210	303	159	1014	195	297	156	910	180	291	153
41000	-48	-54	–	–	–	–	–	–	–	–	917	179	297	149

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-61. MAXIMUM RANGE POWER - 1800 RPM - ISA

MAXIMUM RANGE POWER
1800 RPM
ISA + 10°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	30	86	1261	404	232	229	1167	390	229	226	1074	376	225	223
5000	20	68	1252	366	239	220	1162	354	236	217	1072	341	232	213
10000	11	51	1227	330	247	211	1143	319	243	207	1058	308	240	204
15000	1	34	1183	295	255	201	1106	285	251	198	1029	276	247	195
20000	-8	17	1125	263	264	192	1055	255	260	189	984	246	255	186
23000	-14	7	1114	250	270	187	1019	238	265	183	952	230	260	180
25000	-18	0	1109	241	273	183	1016	229	269	180	929	219	264	176
27000	-22	-7	1096	233	277	179	1010	222	272	176	920	211	267	173
28000	-24	-10	1088	229	279	177	1004	219	274	174	917	208	269	171
29000	-25	-14	1082	226	281	175	998	215	276	172	913	204	271	169
31000	-29	-21	1091	222	285	172	982	208	280	168	901	197	275	165
33000	-33	-27	1100	219	289	168	990	204	284	165	885	190	279	161
35000	-37	-34	1107	216	294	164	997	200	288	161	890	186	282	158
37000	-39	-37	1116	214	299	161	1007	198	293	157	899	183	287	154
39000	-38	-37	–	–	–	–	1019	198	300	154	911	182	294	150
41000	–	–	–	–	–	–	–	–	–	–	–	–	–	–

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-62. MAXIMUM RANGE POWER - 1800 RPM - ISA + 10°C

MAXIMUM RANGE POWER
1800 RPM
ISA + 20°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	40	103	1194	398	229	223	1094	383	225	219	995	367	221	215
5000	30	86	1200	363	237	214	1103	348	233	211	1007	334	229	207
10000	21	69	1191	329	246	206	1100	316	242	202	1007	303	237	198
15000	11	52	1162	296	255	198	1077	285	251	194	993	274	246	190
20000	2	35	1117	266	265	189	1039	256	260	186	961	246	255	182
23000	-4	25	1115	253	272	184	1011	240	266	181	936	230	261	177
25000	-8	18	1114	245	276	181	1014	232	271	177	918	220	265	173
27000	-12	11	1106	238	281	178	1013	226	275	174	914	213	269	170
28000	-13	8	1100	234	283	176	1009	222	277	172	914	210	271	168
29000	-15	4	1096	231	285	174	1005	219	279	171	913	207	273	167
31000	-19	-2	1109	227	290	171	993	212	284	167	905	200	278	163
33000	-23	-9	1121	224	295	168	1004	208	289	164	893	193	282	160
35000	-26	-16	1133	222	300	165	1015	205	294	161	901	190	287	157
37000	-28	-19	1077	211	293	154	1029	204	300	157	914	188	293	153
39000	-28	-18	–	–	–	–	–	–	–	–	916	185	297	149
41000	–	–	–	–	–	–	–	–	–	–	–	–	–	–

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-63. MAXIMUM RANGE POWER - 1800 RPM - ISA + 20°C

MAXIMUM RANGE POWER
1800 RPM
ISA + 30°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	50	122	1201	406	232	222	1097	389	228	218	995	371	223	214
5000	40	104	1198	368	239	213	1098	352	235	209	998	337	230	205
10000	31	87	1182	333	247	204	1086	319	243	200	991	305	238	196
15000	21	70	1145	299	256	195	1058	287	251	191	971	275	245	187
20000	12	53	1094	268	265	186	1014	257	259	182	934	246	254	177
23000	6	43	1092	255	271	180	982	241	265	176	906	231	259	172
25000	2	36	1093	247	275	176	987	233	268	172	885	220	262	168
27000	-2	29	1085	240	279	173	987	227	272	169	883	213	266	165
28000	-4	26	1079	236	281	171	984	223	274	167	884	210	268	163
29000	-5	22	1074	232	283	169	980	220	276	165	883	207	270	161
31000	-9	15	1081	227	287	166	968	212	280	162	876	200	273	158
33000	-13	9	1089	223	291	162	974	208	284	158	864	193	277	154
35000	-17	2	1007	207	276	148	980	204	288	154	868	188	281	150
37000	-19	-2	–	–	–	–	–	–	–	–	876	185	286	147
39000	–	–	–	–	–	–	–	–	–	–	–	–	–	–
41000	–	–	–	–	–	–	–	–	–	–	–	–	–	–

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 5-64. MAXIMUM RANGE POWER - 1800 RPM - ISA + 30°C

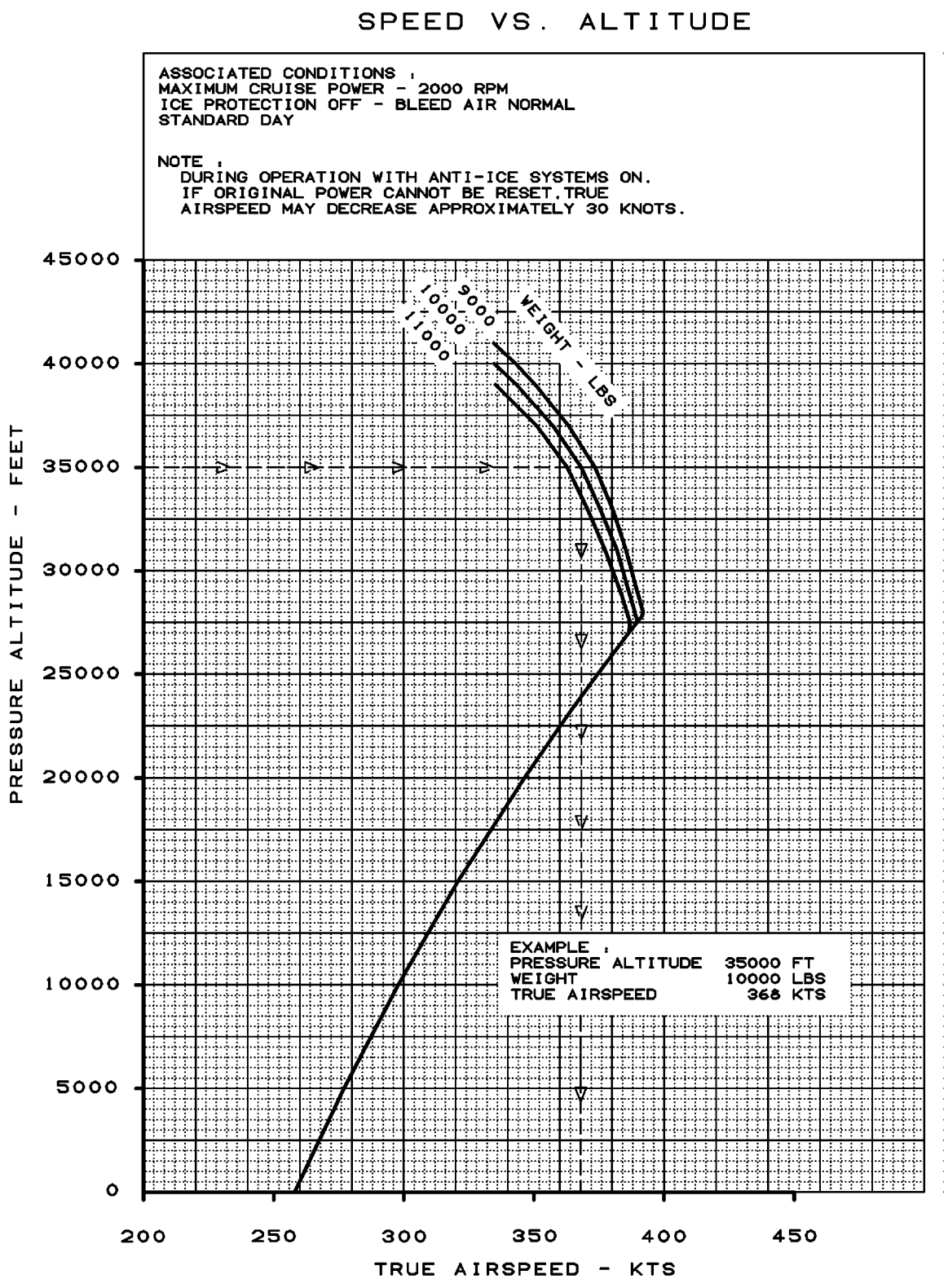
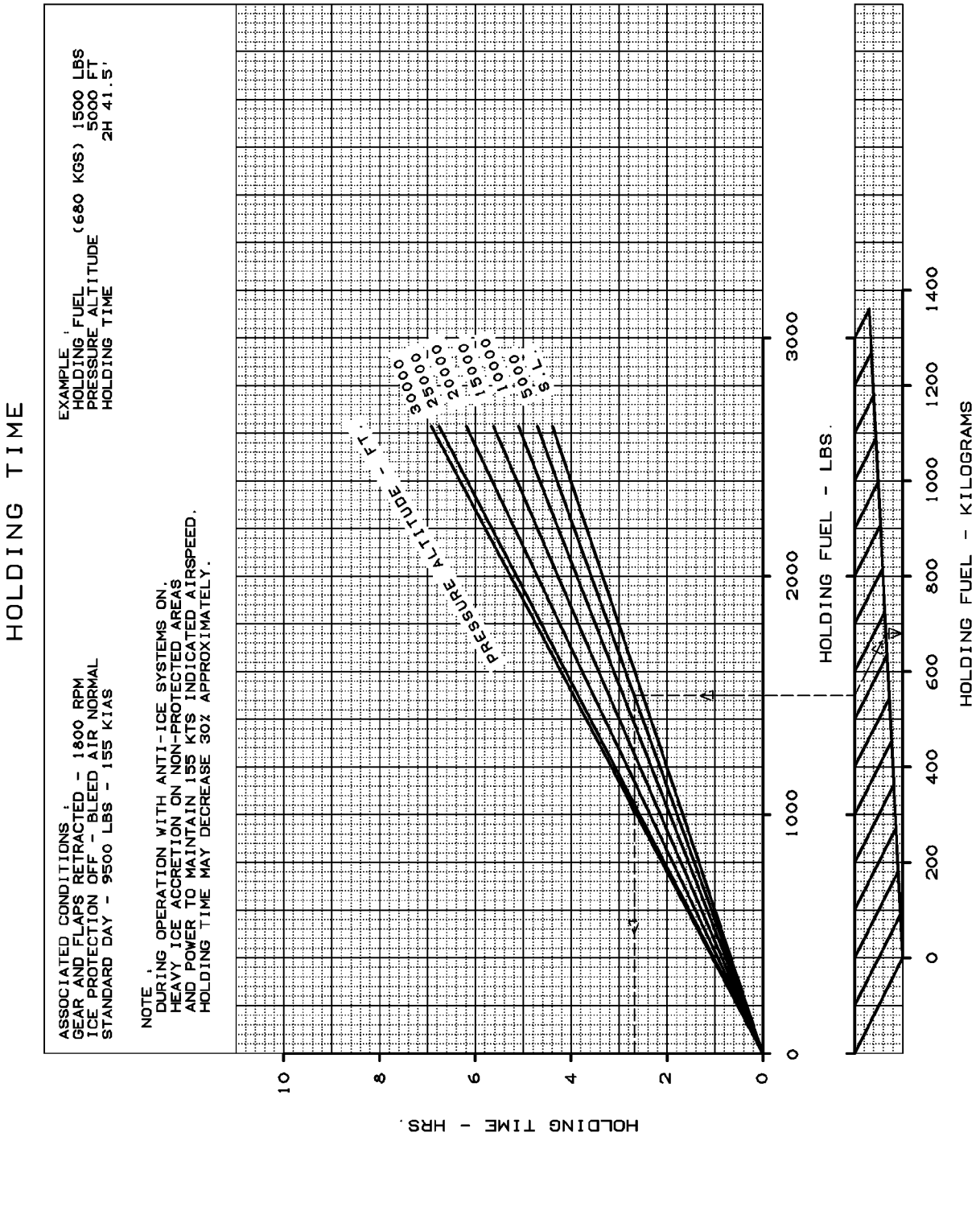
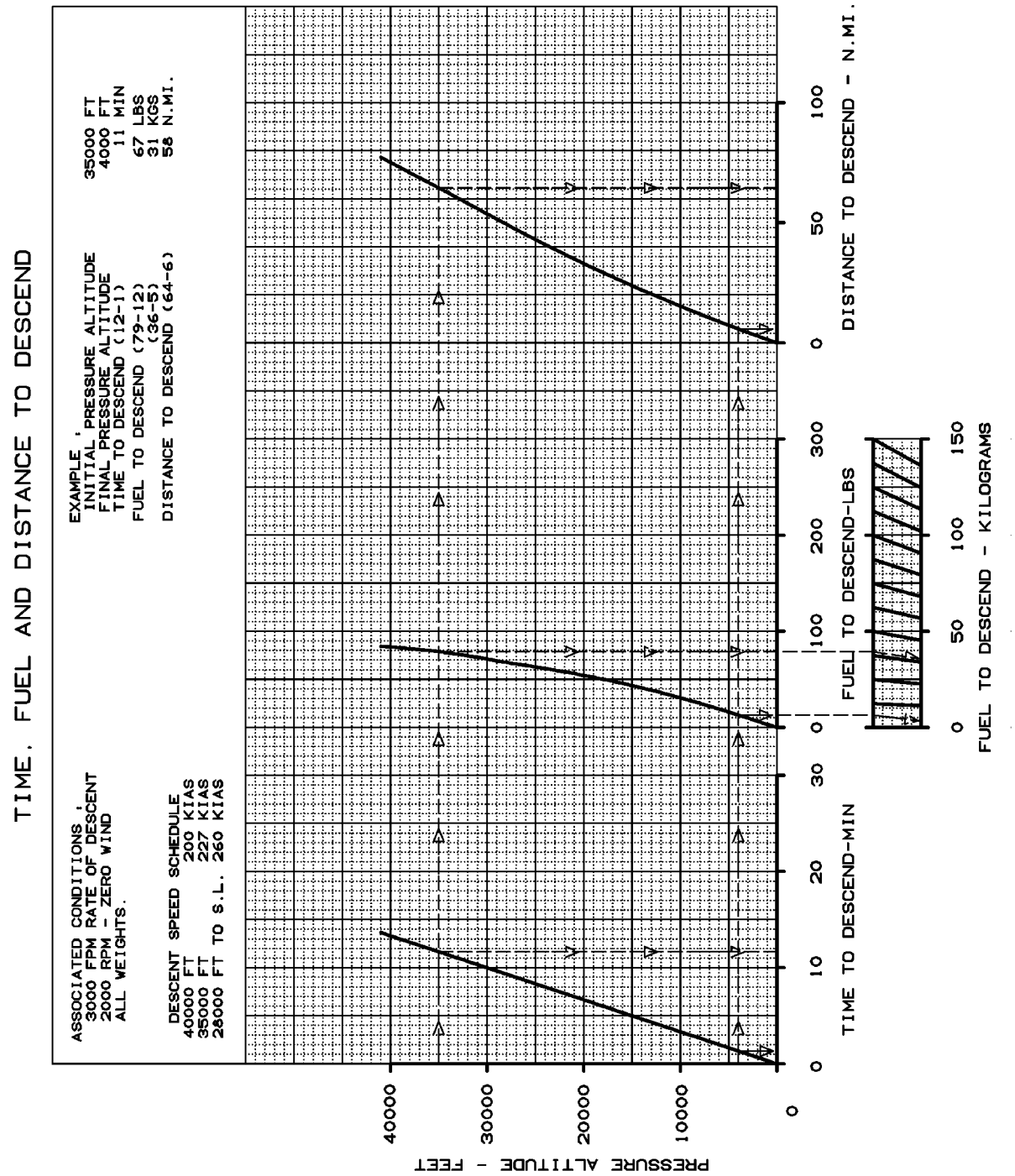


Figure 5-65. SPEED VS. ALTITUDE



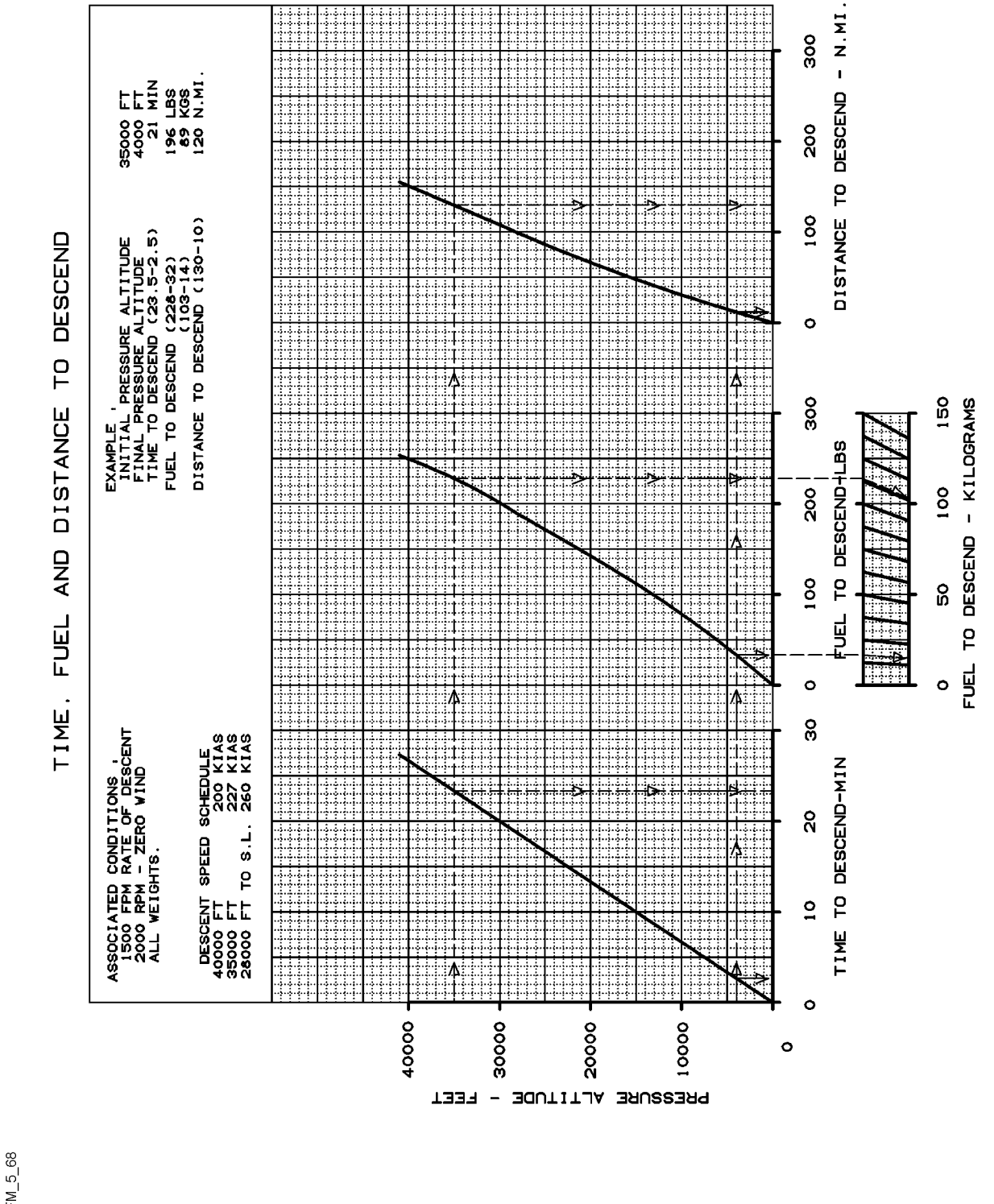
FM_5_66

Figure 5-66. HOLDING TIME



FM_5_67

Figure 5-67. TIME, FUEL, DISTANCE TO DESCEND - 3000 FPM RATE OF DESCENT



FM_5_68

Figure 5-68. TIME, FUEL, DISTANCE TO DESCEND - 1500 FPM RATE OF DESCENT

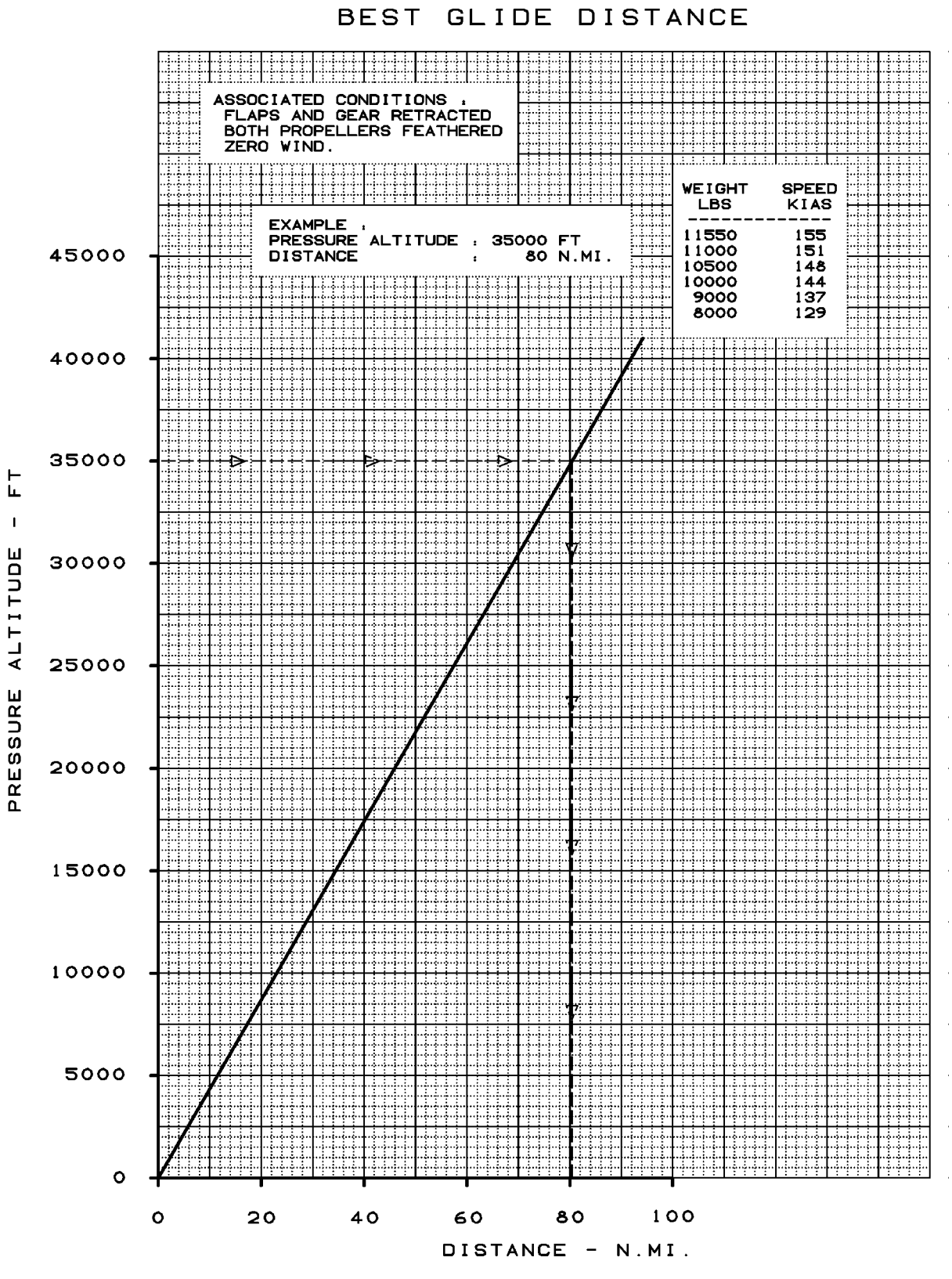


Figure 5-69. BEST GLIDE DISTANCE

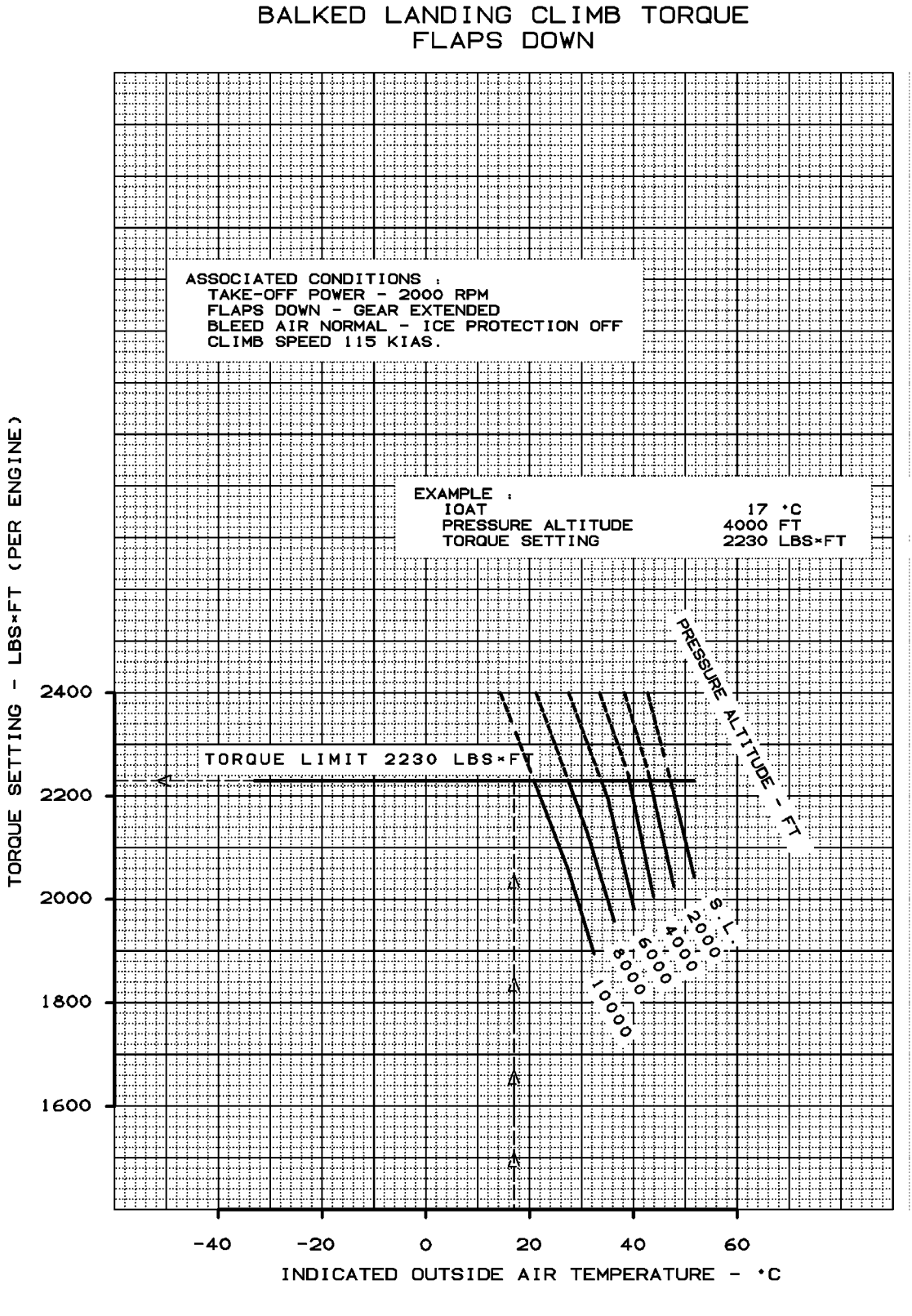
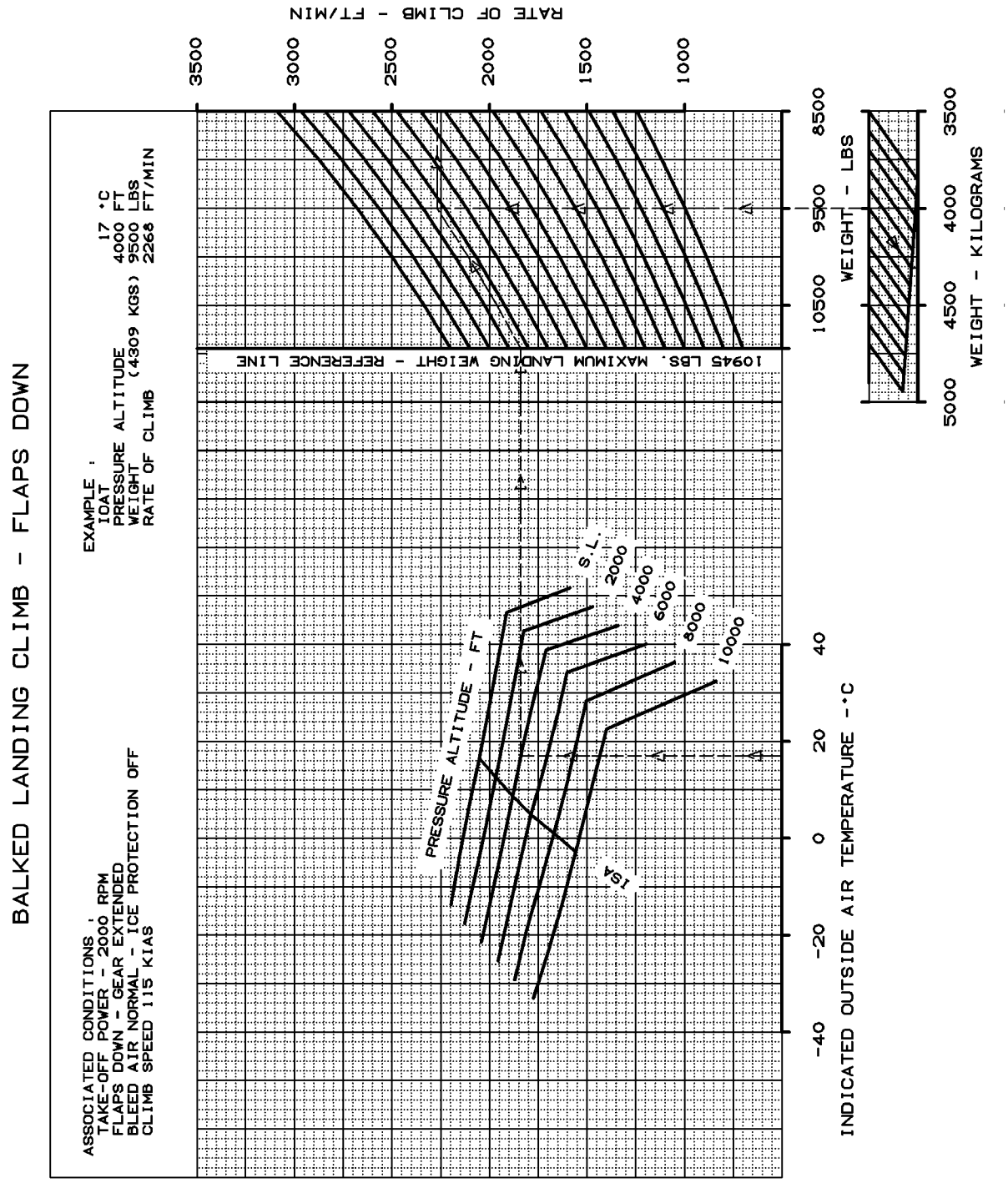


Figure 5-70. BALKED LANDING CLIMB TORQUE - FLAPS DOWN



FM_5_71

Figure 5-71. BALKED LANDING CLIMB - FLAPS DOWN

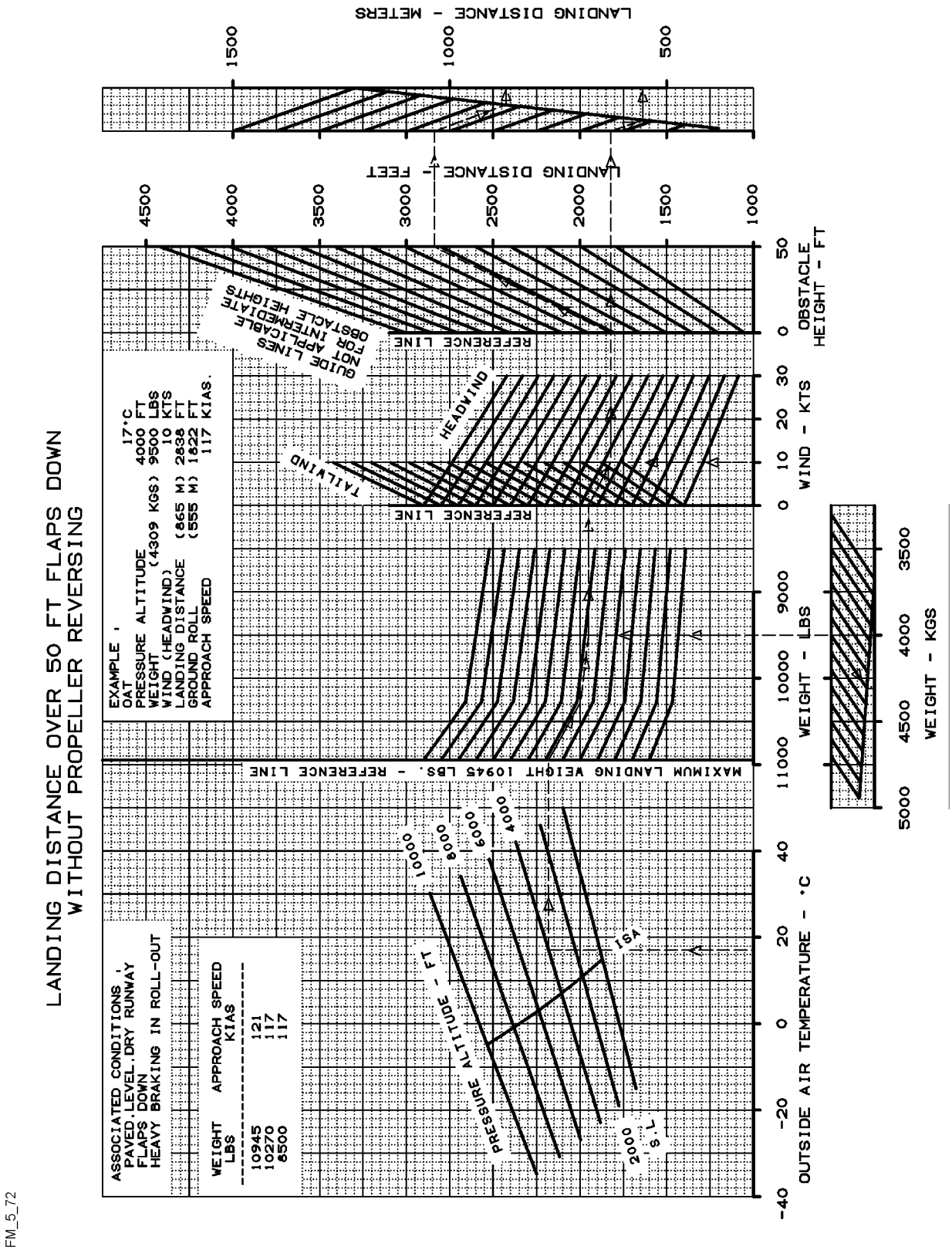
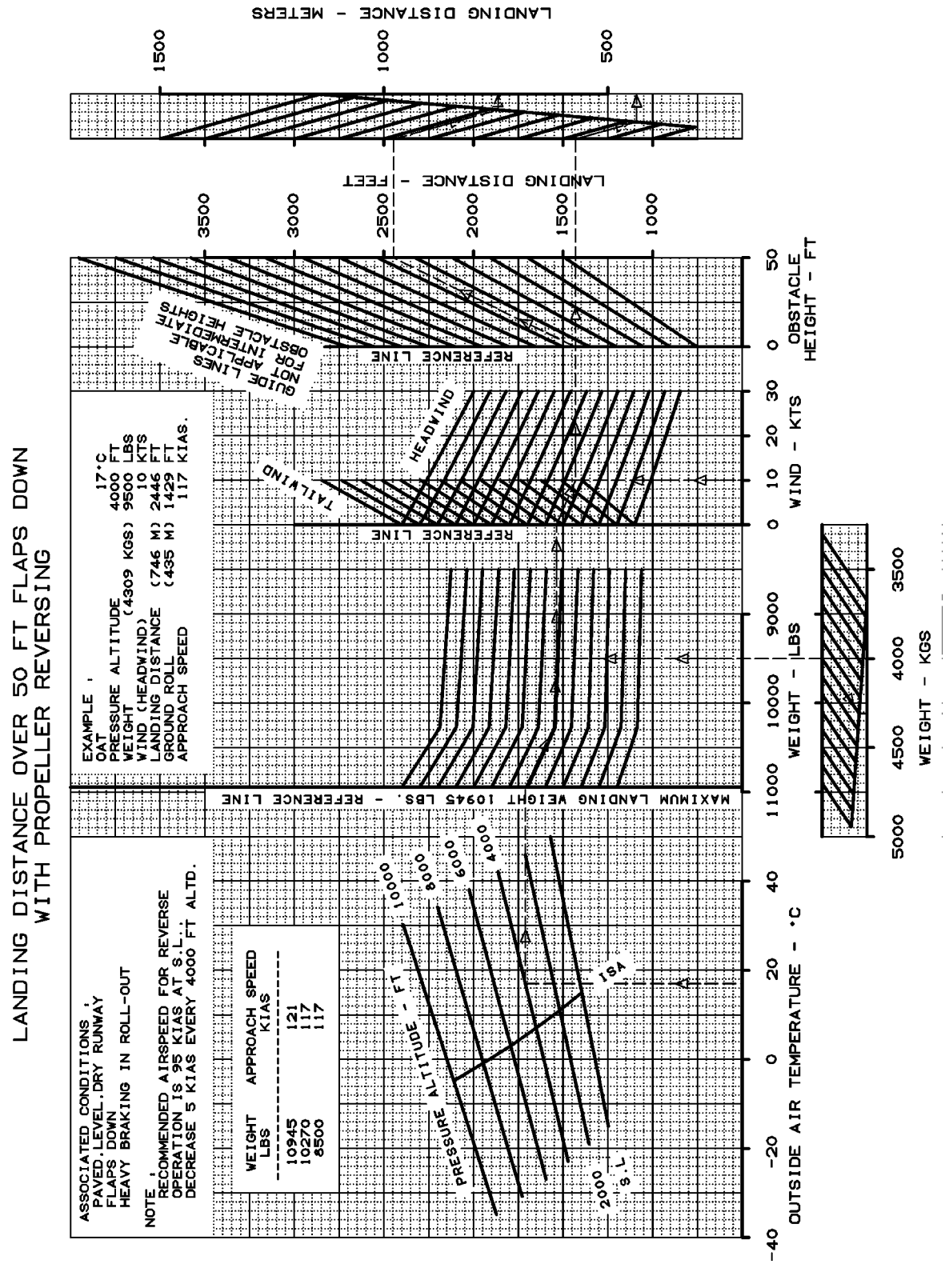


Figure 5-72. LANDING DISTANCE OVER 50 FEET WITHOUT PROPELLER REVERSING - FLAPS DOWN



FM_5_73

Figure 5-73. LANDING DISTANCE OVER 50 FEET WITH PROPELLER REVERSING - FLAPS DOWN

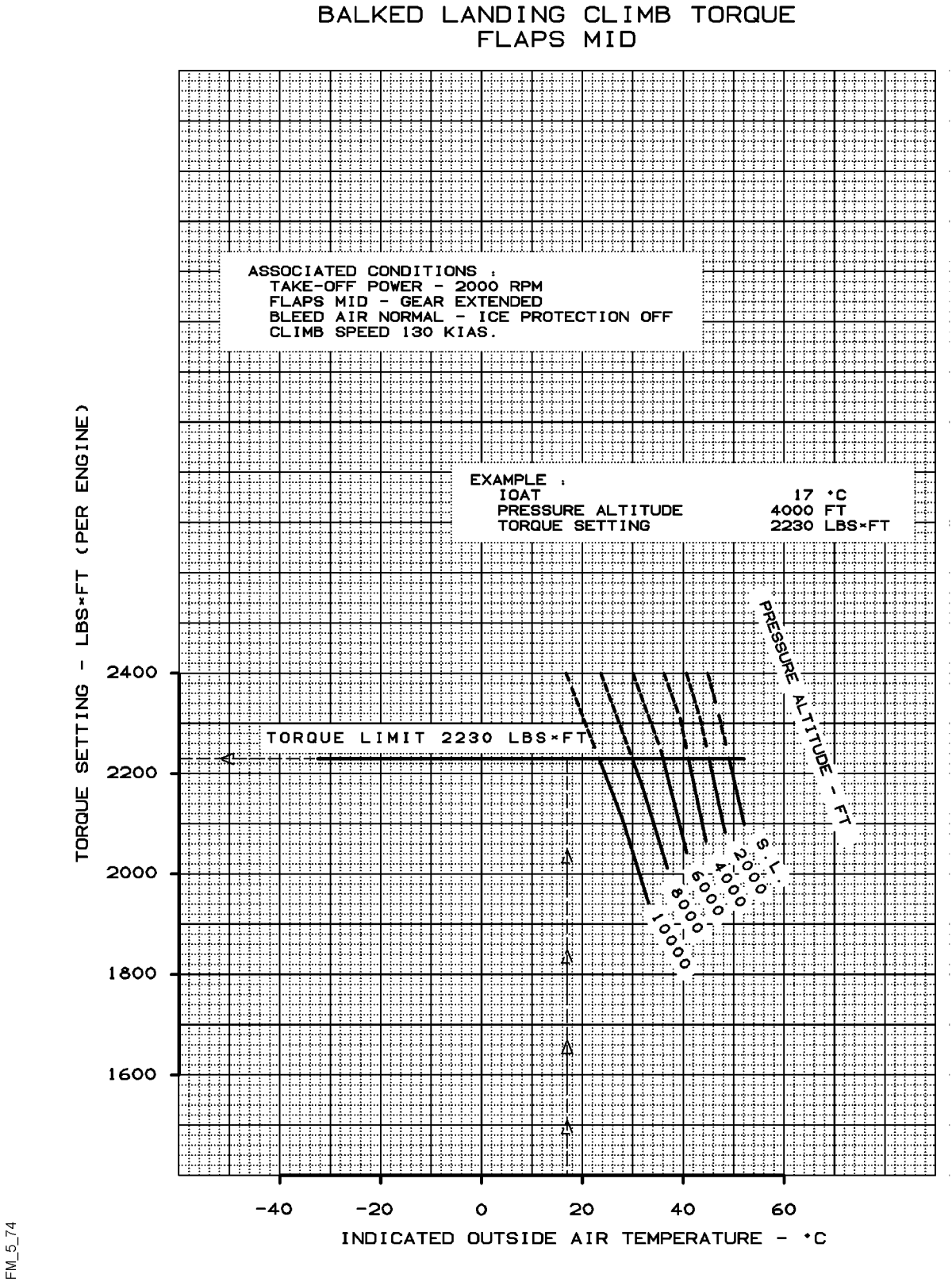
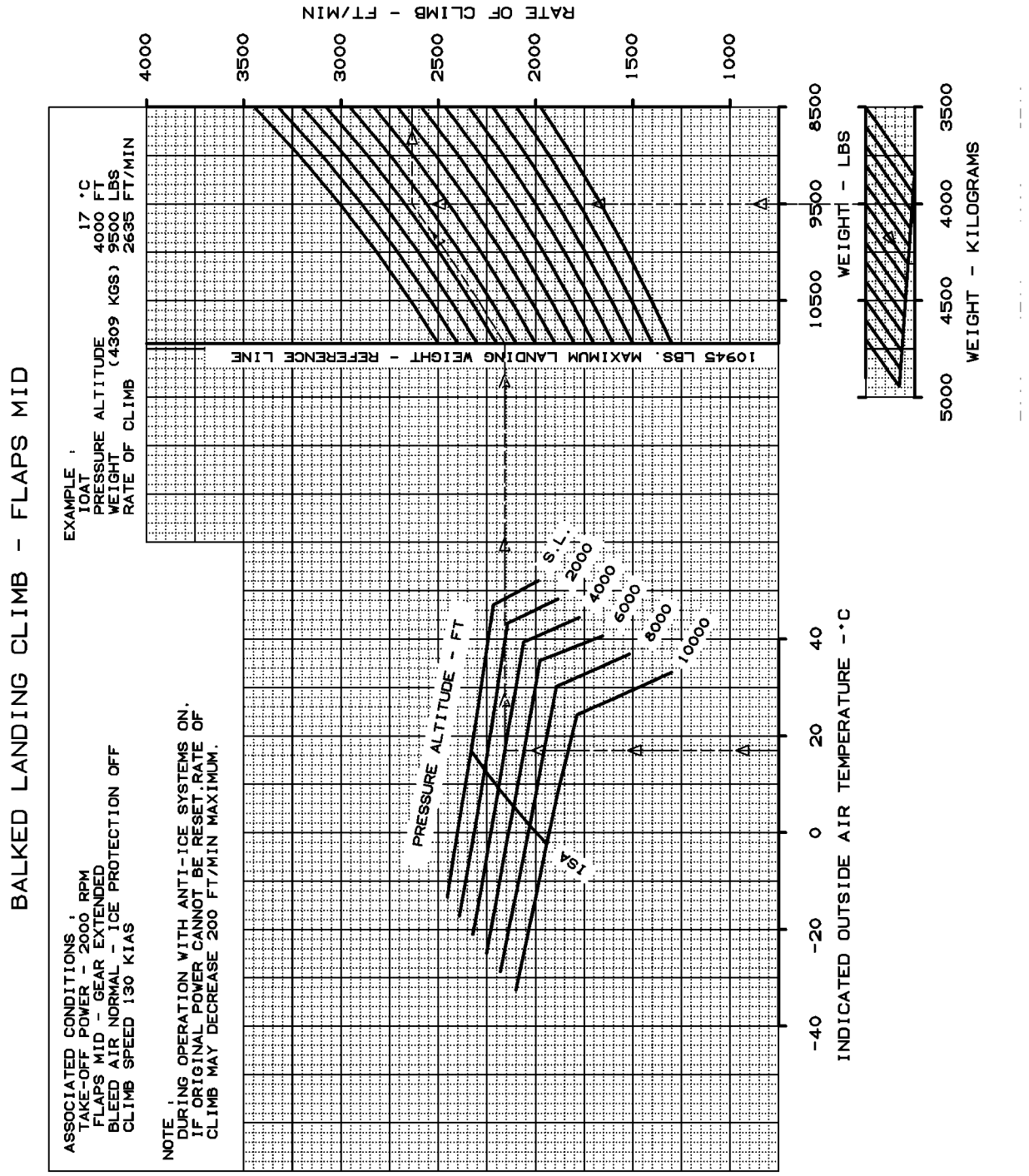
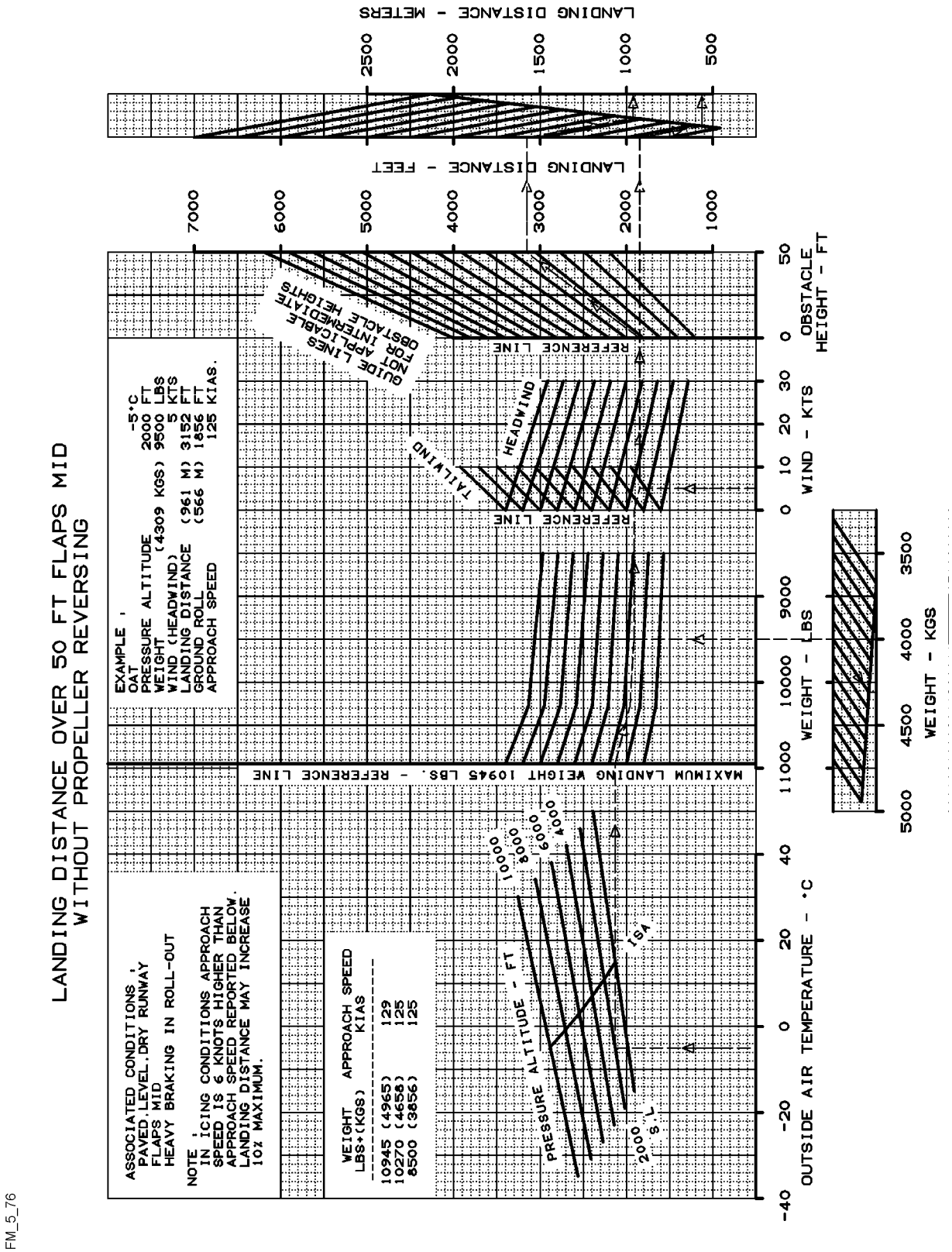


Figure 5-74. BALKED LANDING CLIMB TORQUE - FLAPS MID



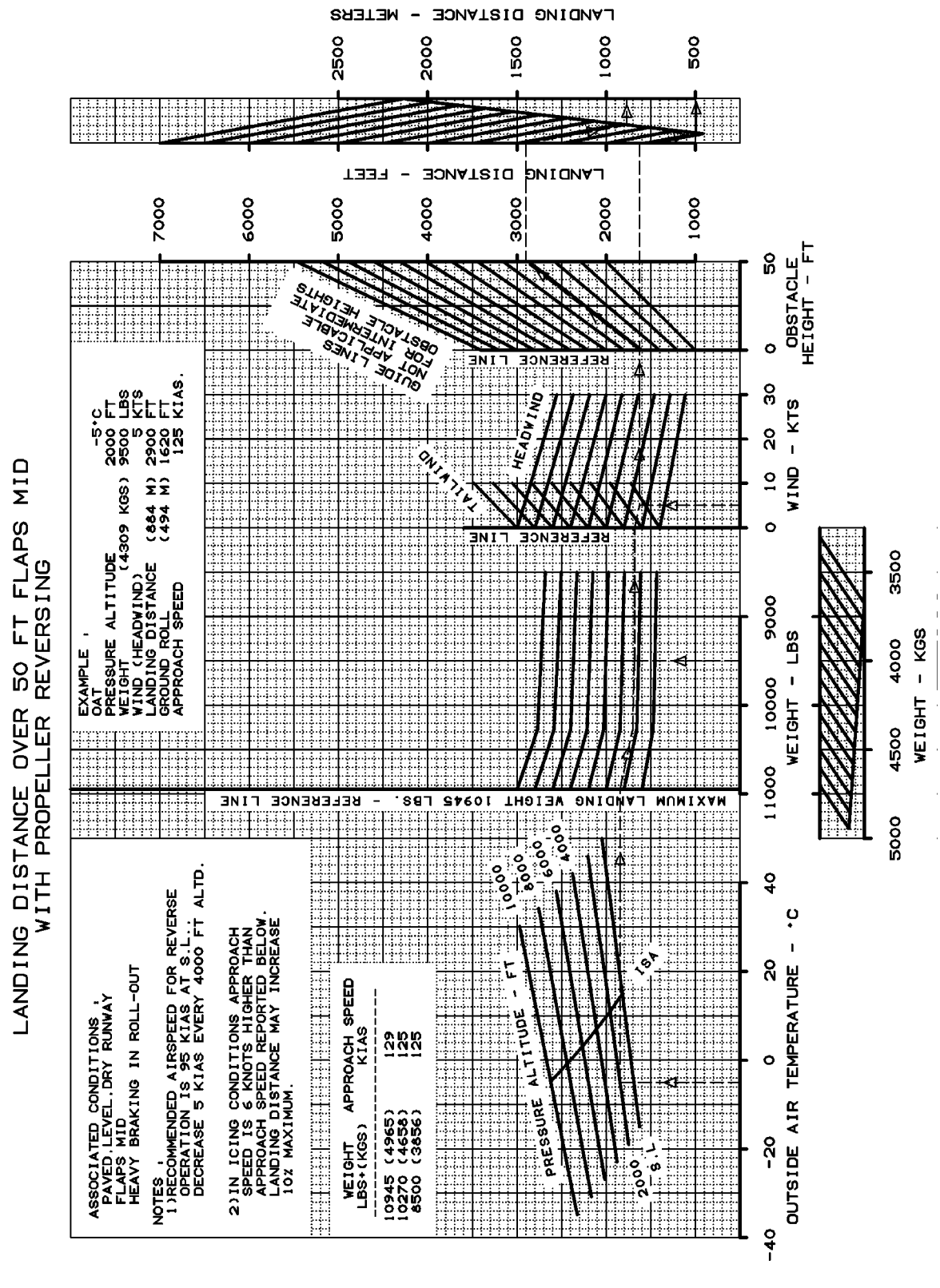
FM_5_75

Figure 5-75. BALKED LANDING CLIMB - FLAPS MID



FM_5_76

Figure 5-76. LANDING DISTANCE OVER 50 FEET WITHOUT PROPELLER REVERSING - FLAPS MID



FM_5_77

Figure 5-77. LANDING DISTANCE OVER 50 FEET WITH PROPELLER REVERSING - FLAPS MID

5.4 TAKEOFF AND LANDING DISTANCE ON CONTAMINATED RUNWAYS

The effects of precipitation on takeoff and landing performance vary with its density and thickness on the runway; density of precipitation characterizes the various types of contamination:

Dry snow	Recent snow fall; cristallization is evident. The characteristics of such snow have not varied. It has not been exposed to temperature exceeding 0°C and therefore has not melted. (Density from 0.2 to 0.35).
Wet snow	This snow has fallen at a temperature very lightly above 0°C. The cristal pattern is partly destroyed and snow has begun to melt under the effect of ambient temperature. (Density from 0.2 to 0.35).
Slush	Water content in this snow is high, however the whole layer is stabilized by its lighter elements. Its surface has a dirty white coloration. (Density from 0.35 to 0.5).
Standing water	Snow which has reached a melting point where it looks like water rather than snow. (Density from 0.8 to 1). or Rain which is falling so abundantly that it cannot be absorbed or evacuated by the ground. (Density = 1).

Operation on icy runways are not recommended due to the significant increase in the stopping distance.

The performance information assumes any standing water, slush or snow to be of uniform depth and density.

The maximum precipitation depth, for which performance calculation has been performed, is given by the following table:

CONDITION	MAXIMUM DEPTH
Dry snow	20mm
Wet snow	15mm
Slush	12mm
Standing water	12mm

5.4.1 TAKEOFF DISTANCE ON CONTAMINATED RUNWAYS

NOTE

The distance corrections are based on calculation and are advisory in nature.

CONDITIONS:

Flaps:. . . . . MID
Runway: . . . . . Paved and covered with precipitation to known mean depth

Apply the following factors to the takeoff distance on paved, dry runway (Figure 5-19 on page 5-25) to find the corresponding takeoff distance on contaminated runway:

CORRECTION FACTORS

Precipitation Depth mm	Dry Snow	Wet Snow	Slush/Standing Water
up to 3	1.04	1.06	1.08
5	1.07	1.10	1.15
10	1.17	1.28	1.44
12	1.23	1.40	1.66
15	1.35	1.72	–
20	1.75	–	–

EXAMPLE:

Precipitation depth: 10mm
Precipitation involved: . . . . . Wet Snow
Takeoff distance on paved, dry runway: . . . . 2850 ft (869 m)

Correction factor: 1.28
Takeoff distance on contaminated runway: . 2850 x 1.28 = 3648 ft (1112 m)

5.4.2 LANDING DISTANCE ON CONTAMINATED RUNWAYS

NOTE

The distance corrections are based on calculation and are advisory in nature.
Landing performance are obtained using the procedure outlined in para. 4.3.25 at Section 4 of this Handbook.

CONDITIONS:

Flaps:. . . . . MID or DN

Runway: . . . . . Paved and covered with precipitation to known mean depth

The landing distance on paved, dry runway (Figure 5-72 on page 5-79 or Figure 5-76 on page 5-83 if landing procedure is performed with flaps DN or flaps MID respectively) must be extended by the following correction factors if reverse thrust is not applied:

CORRECTION FACTORS
(BRAKES ONLY)

Precipitation Depth mm	Dry Snow	Wet Snow	Slush/Standing Water
up to 3	2.00	1.93	1.87
5	1.93	1.83	1.75
10	1.79	1.64	1.53
12	1.74	1.57	1.46
15	1.67	1.49	–
20	1.57	–	–

or by the following correction factors if reverse thrust is applied:

CORRECTION FACTORS
(WITH REVERSE THRUST)

Precipitation Depth mm	Dry Snow	Wet Snow	Slush/Standing Water
up to 3	1.73	1.68	1.65
5	1.68	1.61	1.55
10	1.58	1.46	1.38
12	1.54	1.41	1.33
15	1.49	1.35	–
20	1.41	–	–

EXAMPLE:

Precipitation depth: 10mm
Precipitation involved: . . . . . Wet Snow
Flaps:. . . . . MID
Landing distance on paved, dry runway: . . . 3471 ft (1058 m)
(Figure 5-76 on page 5-83)

If landing procedure will be performed without using reverse thrust:
Correction factor: 1.64
Landing distance on contaminated runway:. 3471 x 1.64 = 5692 ft (1735 m)

If landing procedure will be performed using reverse thrust:
Correction factor: 1.46
Landing distance on contaminated runway:. 3471 x 1.46 = 5068 ft (1545 m)

5.4.3 LANDING DISTANCE ON ICY RUNWAYS

NOTE

The distance corrections are based on calculation and are advisory in nature. Landing performance are obtained using the procedure outlined in para. 4.3.25 at Section 4 of this Handbook.

CONDITIONS:

Flaps:. . . . . MID or DN
Runway: . . . . . Icy runway

The landing distance on paved, dry runway (Figure 5-72 on page 79 or Figure 5-76 on page 83 if landing procedure is performed with flaps DN or flaps MID respectively) must be extended by a factor of 2.7 if reverse thrust is not applied, or by a factor of 2.2 if reverse thrust is applied.

EXAMPLE:

Flaps:. . . . . MID
Landing distance on paved, dry runway: . . . 3471 ft (1058 m)
(Figure 5-76 on page 5-83)

If landing procedure will be performed without using reverse thrust:
Correction factor: 2.7
Landing distance on icy runway:. . . . . 3471 x 2.7 = 9372 ft (2856 m)

If landing procedure will be performed using reverse thrust:
Correction factor: 2.2
Landing distance on icy runway:. . . . . 3471 x 2.2 = 7636 ft (2328 m)

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LIST OF ILLUSTRATIONS

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SECTION 6

WEIGHT AND BALANCE

6.0 GENERAL

In order to achieve the performance and flying characteristics which are designed into the airplane, it must be flown with the weight and center of gravity (C.G.) position within the approved operating range. Although the airplane offers flexibility of loading, it cannot be flown with maximum payload and maximum fuel. The pilot must ensure that the airplane is loaded within the loading envelope before a takeoff.

Using the basic empty weight and C.G. location, the pilot can easily determine the weight and C.G. position for the loaded airplane by computing the total weight and moment and then determining whether they are within the approved envelope.

Refer to the Chapter 25 of the Airplane Maintenance Manual for the seats installation drawings and position identification.

The basic empty weight and C.G. location are recorded in the Airplane Weighing Form (Figure 6-1 on page 6-3) and the Weight and Balance Record (Figure 6-2 on page 6-5). The current values should always be used. Whenever new equipment is added or any modification work is done, the owner should make sure that a new basic empty weight and C.G. position have been computed and entered in the Airplane Log Book and Weight and Balance Record.

6.1 AIRPLANE WEIGHING PROCEDURES

At the time of delivery, Piaggio Aero Industries S.p.A. provides each airplane with the basic empty weight and center of gravity location. This data are shown in Weight and Balance Record (Figure 6-2 on page 6-5).

The removal or addition of equipment or airplane modifications can affect the basic empty weight and center of gravity. Use the following weighing procedure to determine the new basic empty weight and center of gravity location:

a. Be certain that all items checked in the airplane equipment list are installed in the proper location in the airplane.
b. Defuel airplane. Then open all fuel drains until all remaining fuel is drained.
c. Fill to full capacity with engine oil and operating fluids.
d. Place pilot and copilot seats in a center position on the seat tracks. Put flaps in the fully retracted position and all control surfaces in the neutral position. Cabin door and baggage door should be closed.
e. Weigh the airplane inside a close building to prevent errors in the scale readings due to wind. The scales used should be properly calibrated and certified in accordance with the Bureau of Standards.
f. With the airplane on scales, place the levels on leveling provisions as per the "Leveling" procedure at Section 8 of this Handbook.

The airplane may be weighed either on wheels or on jacking points.

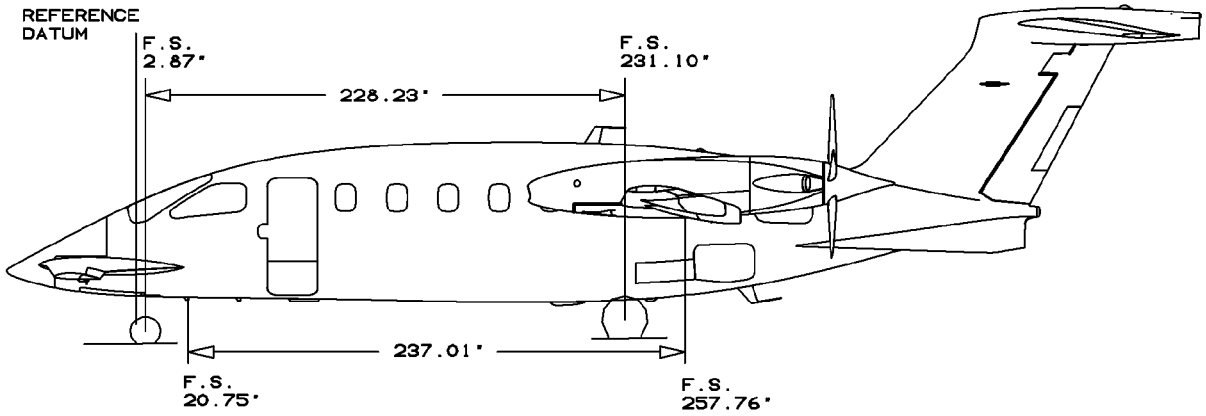
g. When the airplane is weighed on wheels, leveling may be obtained by placing a thin wooden shim under the nose gear wheel and/or conveniently deflating the nose gear tire.
h. With the airplane level record the weight shown on each scale. Deduct the tare, if any, from each reading. Compute total weight and C.G. arm of the airplane as weighed then complete the Airplane Weighing Form (Figure 6-1 on page 6-3) to obtain the basic empty weight and related C.G. arm.

NOTE

The basic empty weight includes full engine oil capacity, full operating fluids and unusable fuel, except potable water and lavatory precharge water.

AIRPLANE WEIGHING FORM

Serial No.: _____ Registration No.: _____ Date: _____



F.S. - Fuselage Station, a position along the fuselage measured in inches from the reference datum.

AIRPLANE AS WEIGHED
(Including full oil and operating fluids but no usable fuel)

POSITION		SCALE READING	TARE	NET WEIGHT
Left Main Wheel	(W_l)			
Right Main Wheel	(W_r)			
Subtotal	(W_s)			
Nose Wheel	(W_n)			
AIRPLANE TOTAL AS WEIGHED (W)				

C.G. Arm of airplane as weighed:

A. ON WHEELS: $231.10 - \frac{(228.23)W_n}{W}$ = inches aft of reference datum

B. ON JACKS: $257.76 - \frac{(237.01)W_n}{W}$ = inches aft of reference datum

BASIC EMPTY WEIGHT AND C.G.

ITEM		WEIGHT (LBS)	C.G. ARM (IN.)	MOMENT (LBS · IN./100)
TOTAL AS WEIGHED				
Add - Drainable Unusable Fuel (if weighed with fuel drained)				
Optional Equipment (if applicable)				
BASIC EMPTY WEIGHT				

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Figure 6-1. AIRPLANE WEIGHING FORM

6.2 WEIGHT AND BALANCE RECORD

The "Weight and Balance Record" form (Figure 6-2 on page 6-5) is provided to present the current status of the airplane basic empty weight and a complete history of previous modifications. Any change to the permanently installed equipment or modification which affects weight or moment must be entered in the Weight and Balance Record.
The basic empty weight and moment of the airplane as delivered at the factory has been entered in the Weight and Balance Record.

NOTE

Equipment List data must be used in the event of configuration changes involving airplane weight and balance. Refer to the suitable Equipment List paragraph in this Section or in the affected Supplement to redefine the airplane weight and C.G. position associated with the new configuration.

WEIGHT AND BALANCE RECORD

(Continuous History of Changes in Structure or Equipment Affecting Weight and Balance)

AIRPLANE MODEL			SERIAL NUMBER			PAGE NUMBER																	
DATE	ITEM NO.		DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT CHANGE														RUNNING BASIC EMPTY WEIGHT					
				ADDED (+)						REMOVED (−)													
	In	Out		Wt. (lb.)	Arm (In.)	Moment /100	Wt. (lb.)	Arm (In.)	Moment /100	Wt. (lb.)	Arm (In.)	Moment /100	Wt. (lb.)	Arm (In.)	Moment /100	Wt. (lb.)	Arm (In.)	Moment /100	Wt. (lb.)	Arm (In.)	Moment /100	Wt. (lb.)	Arm (In.)	Moment /100
			AS DELIVERED																				

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Figure 6-2. WEIGHT AND BALANCE RECORD

6.3 LOADING INSTRUCTIONS

It is the responsibility of the airplane operator to ensure that the airplane is properly loaded. At the time of delivery, Piaggio Aero Industries S.p.A. provides the necessary weight and balance data to compute individual loadings. All subsequent changes in airplane weight and balance are the responsibility of the airplane owner and/or operator.

The basic empty weight and moment of the airplane at the time of delivery are shown on the Weight and Balance Record form (Figure 6-2 on page 6-5). Useful load items which may be loaded into the airplane are shown on the Loading Charts (Figure 6-6 on page 6-11 and following as appropriate). The minimum and maximum approved moments are shown on the Weight, Moment and Center of Gravity Limits graph (Figure 6-3/1 on page 6-7 and Figure 6-3/2 on page 6-8/1, as applicable) or table (Figure 6-4/1 on page 6-8 and Figure 6-4/2 on page 6-8/2, as applicable). These moments correspond to the forward and aft Center of Gravity Flight Limits (landing gear down) for a particular weight. All moments are divided by 100 to simplify computations.

6.4 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT

This paragraph describes the procedure to calculate weight and moment for various phases of a planned flight by using the Weight and Balance Loading Form (Figure 6-5 on page 6-9)

a. Record the current basic empty weight and moment from the Airplane Weighing Form (Figure 6-1 on page 6-3) The moment must be divided by 100 to correspond to Loading Charts moments.
If the airplane has been altered, refer to the Weight and Balance Record (Figure 6-2 on page 6-5) for this information.

b. Record the weight and corresponding moment of each item to be carried. For the operator convenience the most useful loads, related C.G. nominal positions and moments can be found on the Loading Charts (Figure 6-6 on page 6-11 and following as appropriate). For any load not located as per the Loading Charts nominal positions it will be necessary to determine its own C.G. and its location in the airplane. Determine the C.G. arm (Fuselage Station) by measuring in inches, from a known location in the cabin to the C.G. of the load. Determine the "moment" for the load by multiplying the weight by the C.G. arm (Fuselage Station). This resultant should be divided by 100 to be compatible with other loading data.

NOTE

For the adjustable seats the centered nominal position is given in the "OCCUPANTS" tables of the Loading Charts. Typical adjustable seat allows a 8-inches full longitudinal travel.

c. Total the weight column and moment column. The total weight without usable fuel must not exceed the Maximum Zero Fuel Weight limitation. All weight in excess of this limitaion must be fuel. The total takeoff weight must not exceed the maximum allowable takeoff weight and the total moment must be within the minimum and maximum moments shown on the Weight, Moment and Center of Gravity Limits graph or table.

d. Using the Loading Chart - Usable Fuel, determine the weight and corresponding moment of fuel to be used by subtracting the amount on board on landing from the amount on board at takeoff.

e. For landing configuration weight and balance, subtract the weight and moment of fuel to be used from the takeoff weight and moment. The landing moment must be within the minimum and maximum moments shown on Weight, Moment and Center of Gravity Limits graph or table for that weight.
If the total moment is less than the minimum moment allowed, useful load items must be shifted aft, or forward load items reduced.
If the total moment is greater that the maximum moment allowed, useful load items must be shifted forward, or aft load items reduced. If the quantity or location of load items is changed, the calculations must be revised and moments rechecked.

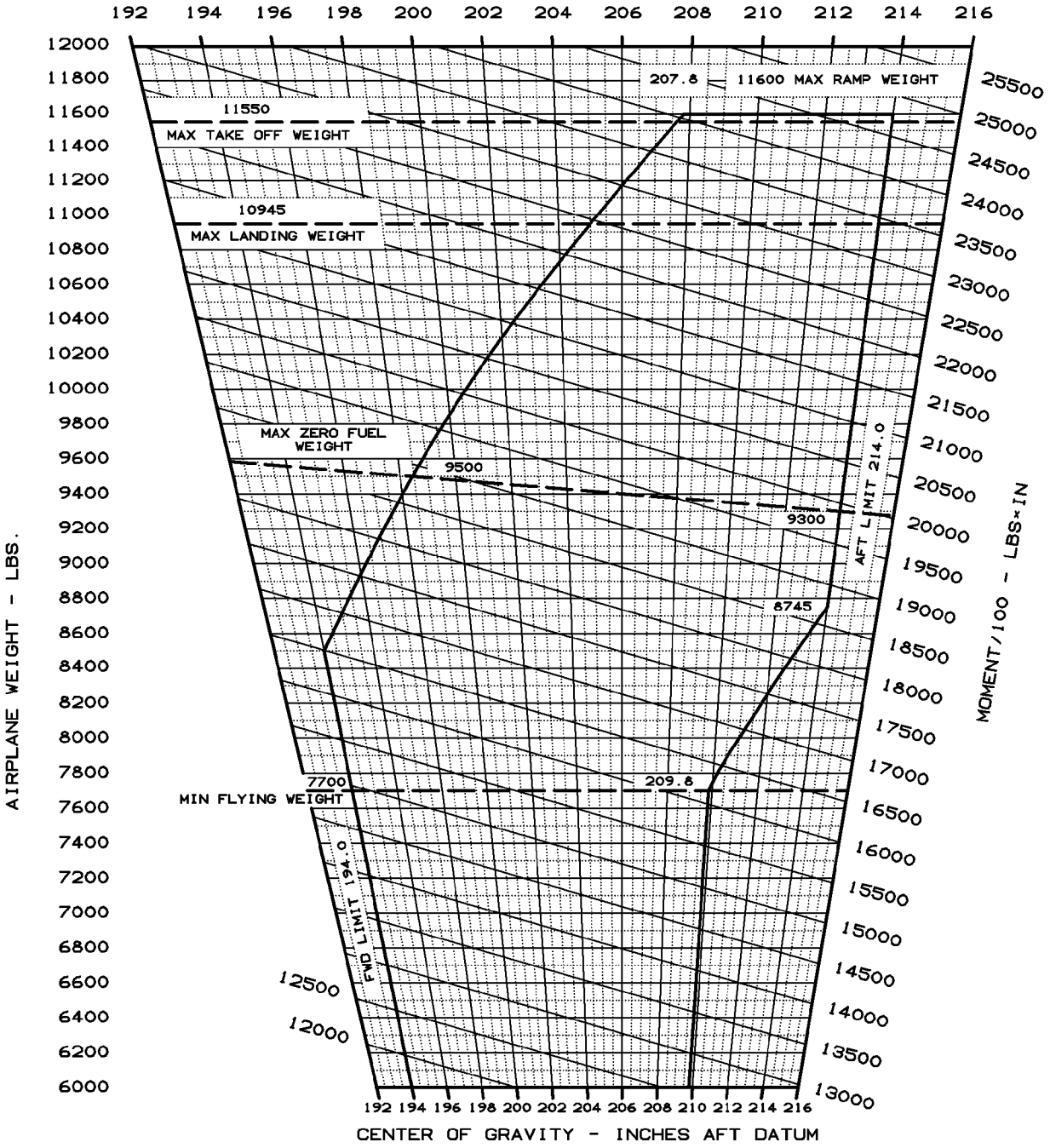

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Figure 6-3/1. WEIGHT, MOMENT AND CENTER OF GRAVITY LIMITS GRAPH (S.N. 1004 TO 1015 AIRPLANES)

PIAGGIO AERO

MOMENT AND CENTER OF GRAVITY LIMITS VS. WEIGHT

(LANDING GEAR DOWN)

	FORWARD		AFT				FORWARD		AFT	
Weight LBS	Minimum Moment/100	CG Limit IN	Maximum Moment/100	CG Limit IN		Weight LBS	Minimum Moment/100	CG Limit IN	Maximum Moment/100	CG Limit IN
6000	11640	194.00	12588	209.80		8880	17378	195.69	19003	214.00
6050	11737		12693			8900	17425	195.78	19046	
6100	11834		12798			8950	17543	196.01	19153	
6150	11931		12903			9000	17661	196.23	19260	
6200	12028		13008			9050	17779	196.45	19367	
6250	12125		13113			9100	17897	196.67	19474	
6300	12222		13217			9150	18016	196.90	19581	
6350	12319		13322			9200	18135	197.12	19688	
6400	12416		13427		MAX ZERO FUEL WEIGHT	9250	18254	197.34	19795	
6450	12513		13532		AFT C.G.	9300	18374	197.57	19902	
6500	12610		13637			9350	18493	197.79	20009	
6550	12707		13742			9400	18613	198.01	20116	
6600	12804		13847		MAX ZERO FUEL WEIGHT	9450	18733	198.24	20223	
6650	12901		13952		FWD C.G.	9500	18854	198.46	20330	
6700	12998		14057			9550	18974	198.68	20437	
6750	13095		14162			9600	19095	198.90	20544	
6800	13192		14266			9650	19216	199.13	20651	
6850	13289		14371			9700	19337	199.35	20758	
6900	13386		14476			9750	19458	199.57	20865	
6950	13483		14581			9800	19580	199.80	20972	
7000	13580		14686			9850	19702	200.02	21079	
7050	13677		14791			9900	19824	200.24	21186	
7100	13774		14896			9950	19946	200.46	21293	
7150	13871		15001			10000	20069	200.69	21400	
7200	13968		15106			10050	20191	200.91	21507	
7250	14065		15211			10100	20314	201.13	21614	
7300	14162		15315			10150	20438	201.36	21721	
7350	14259		15420			10200	20561	201.58	21828	
7400	14356		15525			10250	20685	201.80	21935	
7450	14453		15630			10270	20734	201.89	21978	
7500	14550		15735			10300	20809	202.02	22042	
7550	14647		15840			10350	20933	202.25	22149	
7600	14744		15945			10400	21057	202.47	22256	
7650	14841		16050			10450	21181	202.69	22363	
7700	14938		16155	209.80		10500	21306	202.92	22470	
7750	15035		16275	210.00		10550	21431	203.14	22577	
7800	15132		16396	210.20		10600	21556	203.36	22684	
7850	15229		16516	210.40		10650	21682	203.59	22791	
7900	15326		16637	210.60		10700	21807	203.81	22898	
7950	15423		16759	210.80		10750	21933	204.03	23005	
8000	15520		16880	211.00		10800	22059	204.25	23112	
8050	15617		17002	211.20		10810	22085	204.30	23133	
8100	15714		17123	211.40		10850	22186	204.48	23219	
8150	15811		17245	211.60		10900	22312	204.70	23326	
8200	15908		17368	211.80		10950	22439	204.92	23433	
8250	16005		17490	212.00		11000	22566	205.15	23540	
8300	16102		17613	212.20		11050	22693	205.37	23647	
8350	16199		17735	212.40		11100	22821	205.59	23754	
8400	16296		17858	212.60		11150	22948	205.81	23861	
8450	16393		17982	212.80		11200	23076	206.04	23968	
8500	16490	194.00	18105	213.00		11250	23204	206.26	24075	
8550	16606	194.22	18229	213.20		11300	23333	206.48	24182	
8600	16722	194.45	18352	213.40		11350	23461	206.71	24289	
8650	16839	194.67	18476	213.60		11400	23590	206.93	24396	
8700	16956	194.89	18601	213.80		11450	23719	207.15	24503	
8745	17061	195.09	18714	214.00		11500	23848	207.38	24610	
8800	17190	195.34	18832	214.00		11550	23978	207.60	24717	
8850	17307	195.56	18939	214.00		11600	24107	207.82	24824	214.00

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Figure 6-4/1. WEIGHT, MOMENT AND CENTER OF GRAVITY LIMITS TABLE (S.N. 1004 TO 1015 AIRPLANES)

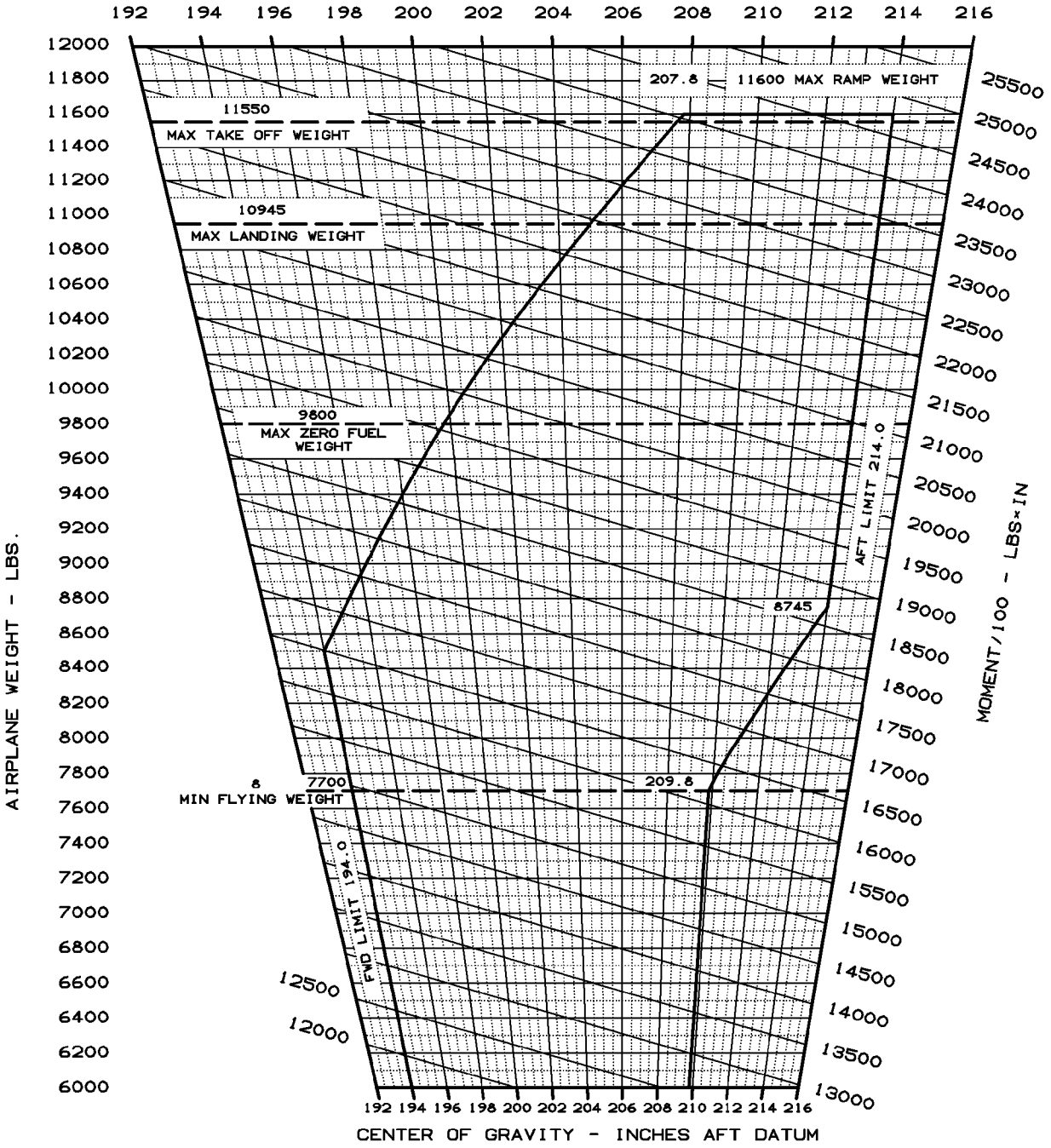

Figure 6-3/2. WEIGHT, MOMENT AND CENTER OF GRAVITY LIMITS GRAPH (S.N. 1016 AND UP AIRPLANES)

PIAGGIO AERO

MOMENT AND CENTER OF GRAVITY LIMITS VS. WEIGHT

(LANDING GEAR DOWN)

	FORWARD		AFT				FORWARD		AFT	
Weight LBS	Minimum Moment/100	CG Limit IN	Maximum Moment/100	CG Limit IN		Weight LBS	Minimum Moment/100	CG Limit IN	Maximum Moment/100	CG Limit IN
6000	11640	194.00	12588	209.80		8880	17378	195.69	19003	214.00
6050	11737		12693			8900	17425	195.78	19046	
6100	11834		12798			8950	17543	196.01	19153	
6150	11931		12903			9000	17661	196.23	19260	
6200	12028		13008			9050	17779	196.45	19367	
6250	12125		13113			9100	17897	196.67	19474	
6300	12222		13217			9150	18016	196.90	19581	
6350	12319		13322			9200	18135	197.12	19688	
6400	12416		13427			9250	18254	197.34	19795	
6450	12513		13532			9300	18374	197.57	19902	
6500	12610		13637			9350	18493	197.79	20009	
6550	12707		13742			9400	18613	198.01	20116	
6600	12804		13847			9450	18733	198.24	20223	
6650	12901		13952			9500	18854	198.46	20330	
6700	12998		14057			9550	18974	198.68	20437	
6750	13095		14162			9600	19095	198.90	20544	
6800	13192		14266			9650	19216	199.13	20651	
6850	13289		14371			9700	19337	199.35	20758	
6900	13386		14476		MAX ZERO FUEL WEIGHT	9750	19458	199.57	20865	
6950	13483		14581			9800	19580	199.80	20972	
7000	13580		14686			9850	19702	200.02	21079	
7050	13677		14791			9900	19824	200.24	21186	
7100	13774		14896			9950	19946	200.46	21293	
7150	13871		15001			10000	20069	200.69	21400	
7200	13968		15106			10050	20191	200.91	21507	
7250	14065		15211			10100	20314	201.13	21614	
7300	14162		15315			10150	20438	201.36	21721	
7350	14259		15420			10200	20561	201.58	21828	
7400	14356		15525			10250	20685	201.80	21935	
7450	14453		15630			10270	20734	201.89	21978	
7500	14550		15735			10300	20809	202.02	22042	
7550	14647		15840			10350	20933	202.25	22149	
7600	14744		15945			10400	21057	202.47	22256	
7650	14841		16050			10450	21181	202.69	22363	
7700	14938		16155	209.80		10500	21306	202.92	22470	
7750	15035		16275	210.00		10550	21431	203.14	22577	
7800	15132		16396	210.20		10600	21556	203.36	22684	
7850	15229		16516	210.40		10650	21682	203.59	22791	
7900	15326		16637	210.60		10700	21807	203.81	22898	
7950	15423		16759	210.80		10750	21933	204.03	23005	
8000	15520		16880	211.00		10800	22059	204.25	23112	
8050	15617		17002	211.20		10810	22085	204.30	23133	
8100	15714		17123	211.40		10850	22186	204.48	23219	
8150	15811		17245	211.60		10900	22312	204.70	23326	
8200	15908		17368	211.80		10950	22439	204.92	23433	
8250	16005		17490	212.00		11000	22566	205.15	23540	
8300	16102		17613	212.20		11050	22693	205.37	23647	
8350	16199		17735	212.40		11100	22821	205.59	23754	
8400	16296		17858	212.60		11150	22948	205.81	23861	
8450	16393		17982	212.80		11200	23076	206.04	23968	
8500	16490	194.00	18105	213.00		11250	23204	206.26	24075	
8550	16606	194.22	18229	213.20		11300	23333	206.48	24182	
8600	16722	194.45	18352	213.40		11350	23461	206.71	24289	
8650	16839	194.67	18476	213.60		11400	23590	206.93	24396	
8700	16956	194.89	18601	213.80		11450	23719	207.15	24503	
8745	17061	195.09	18714	214.00		11500	23848	207.38	24610	
8800	17190	195.34	18832	214.00		11550	23978	207.60	24717	
8850	17307	195.56	18939	214.00		11600	24107	207.82	24824	214.00

Figure 6-4/2. WEIGHT, MOMENT AND CENTER OF GRAVITY LIMITS TABLE (S.N. 1016 AND UP AIRPLANES)

WEIGHT AND BALANCE LOADING FORM

SERIAL NO.	REGISTRATION NO.	DATE

PAYLOAD COMPUTATIONS			
ITEM OCCUPANTS OR CARGO	ARM	WEIGHT	MOM/100
REAR BAGGAGE COMP.			
CABIN BAGGAGE COMP.			
FORWARD CABINET			
REFRESHMENT CABINET			
TOTAL PAYLOAD			

REF	ITEM	WEIGHT	MOM/100
1.	BASIC EMPTY WEIGHT		
2.	PAYLOAD		
3.	WEIGHT (LESS FUEL) (Sub-total) (Do not exceed max. zero fuel weight: see LIMITATIONS)		
4.	FUEL LOADING		
* 5.	RAMP CONDITION (Sub-total)		
6.	LESS FUEL FOR START & TAXI		
* 7.	TAKEOFF CONDITION		
8.	LESS FUEL TO DESTINATION		
* 9.	LANDING WEIGHT		

* Totals must be within approved weight and C.G. limits. It is the responsibility of the airplane owner and the pilot to insure that the airplane is loaded properly. The Basic Empty Weight C.G. is noted on the Airplane Weighing Form. If the airplane has been altered, refer to Weight and Balance Record for this information.

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Figure 6-5. WEIGHT AND BALANCE LOADING FORM

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USABLE FUEL

		6.42 LBS/GAL (0.77 KG/L)		6.59 LBS/GAL (0.79 KG/L)		6.76 LBS/GAL (0.81 KG/L)	
U.S. GAL.	LITERS	WEIGHT LBS	MOMENT LBS · IN/100	WEIGHT LBS	MOMENT LBS · IN/100	WEIGHT LBS	MOMENT LBS · IN/100
10	38	64	158.85	66	163.81	68	168.78
20	76	128	317.70	132	327.62	135	335.07
30	114	193	479.03	198	491.44	203	503.85
40	151	257	637.87	264	655.25	270	670.14
50	189	321	796.72	330	819.06	338	838.92
60	227	385	955.57	395	980.39	406	1007.69
70	265	449	1114.42	461	1144.20	473	1173.99
80	303	514	1275.75	527	1308.01	541	1342.76
90	341	578	1434.60	593	1471.83	608	1509.06
100	378	642	1593.44	659	1635.64	676	1677.83
110	416	706	1752.29	725	1799.45	744	1846.61
120	454	770	1911.14	791	1963.26	811	2012.90
130	492	835	2072.47	857	2127.07	879	2181.68
140	530	899	2231.32	923	2290.89	946	2347.97
150	568	963	2390.17	989	2454.70	1014	2516.75
160	606	1027	2549.01	1054	2616.03	1082	2685.52
170	643	1091	2707.86	1120	2779.84	1149	2851.82
180	681	1156	2869.19	1186	2943.65	1217	3020.59
190	719	1220	3028.04	1252	3107.46	1284	3186.89
200	757	1284	3186.89	1318	3271.28	1352	3355.66
210	795	1348	3345.74	1384	3435.09	1420	3524.44
220	833	1412	3504.58	1450	3598.90	1487	3690.73
230	871	1477	3665.91	1516	3762.71	1555	3859.51
240	908	1541	3824.76	1582	3926.52	1622	4025.80
250	946	1605	3983.61	1648	4090.34	1690	4194.58
260	984	1669	4142.46	1713	4251.66	1758	4363.36
270	1022	1733	4301.30	1779	4415.48	1825	4529.65
280	1060	1798	4462.63	1845	4579.29	1893	4698.42
290	1098	1862	4621.48	1911	4743.10	1960	4864.72
300	1135	1926	4780.33	1977	4906.91	2028	5033.49
310	1173	1990	4939.18	2043	5070.72	2096	5202.27
320	1211	2054	5098.03	2109	5234.54	2163	5368.56
330	1249	2119	5259.36	2175	5398.35	2231	5537.34
340	1287	2183	5418.20	2241	5562.16	2298	5703.63
350	1325	2247	5577.05	2307	5725.97	2366	5872.41
360	1363	2311	5735.90	2372	5887.30	2434	6041.19
370	1400	2375	5894.75	2438	6051.11	2501	6207.48
380	1438	2440	6056.08	2504	6214.93	2569	6376.25
390	1476	2504	6214.93	2570	6378.74	2636	6542.55
393	1488	2523	6262.08	2590	6428.38	2657	6594.67
FOLLOWING DATA APPLICABLE TO AIRPLANES WITH EXTENDED WING FUEL TANKS (1)							
400	1514	2568	6373.78	2636	6542.55	2704	6711.33
410	1552	2632	6533.12	2702	6706.12	2772	6879.11
418	1583	2684	6660.60	2755	6836.97	2826	7013.34

(1) S.N. 1016 to 1035 with SB-80-0123 embodied and S.N. 1036 and up airplanes.

Figure 6-6. LOADING CHART-USABLE FUEL

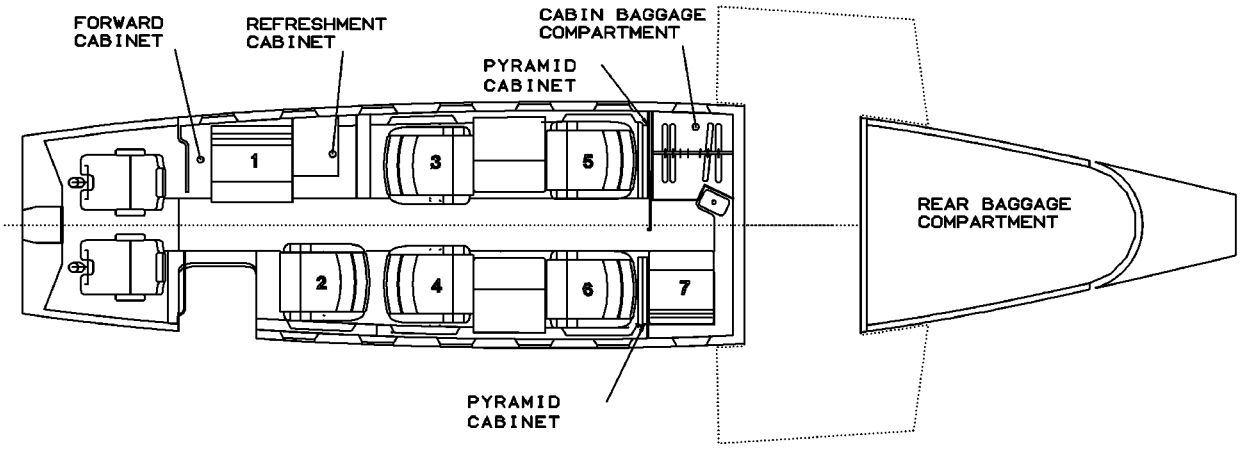
OCCUPANTS

STANDARD CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 82.05 IN	SEAT 2 ARM 107.95 IN	SEATS 3 &4 ARM 136.80 IN	SEATS 5 & 6 ARM 189.20 IN	SEAT 7 ARM 218.18 IN
	MOMENT (LBS · IN/100)					
100	49.20	82.05	107.95	136.80	189.20	218.18
110	54.12	90.26	118.75	150.48	208.12	240.00
120	59.04	98.46	129.54	164.16	227.04	261.82
130	63.96	106.67	140.34	177.84	245.96	283.63
140	68.88	114.87	151.13	191.52	264.88	305.45
150	73.80	123.08	161.93	205.20	283.80	327.27
160	78.72	131.28	172.72	218.88	302.72	349.09
170	83.64	139.49	183.52	232.56	321.64	370.91
180	88.56	147.69	194.31	246.24	340.56	392.72
190	93.48	155.90	205.11	259.92	359.48	414.54
200	98.40	164.10	215.90	273.60	378.40	436.36
210	103.32	172.31	226.70	287.28	397.32	458.18
220	108.24	180.51	237.49	300.96	416.27	480.00

NOTE

Seat 7 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.



FM_6_7

Figure 6-7. LOADING CHART-OCCUPANTS

BAGGAGE (STANDARD CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	REFRESHMENT CABINET FS 93.5 TO 118 ARM 103 IN
	MOMENT (LBS · IN/100)
5	5.15
10	10.30
15	15.45
20	20.60
25	25.75
30	30.90

WEIGHT LBS	PYRAMIDAL CABINET FS 200 TO 206 ARM 204 IN
	MOMENT (LBS · IN/100)
5	10.20
10	20.40

FM_6_8

Figure 6-8. LOADING CHART-BAGGAGE

OCCUPANTS

OPTION # 1 CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 81.30 IN	SEAT 2 ARM 96.25 IN	SEATS 3 ARM 102.80 IN	SEATS 4 & 5 ARM 136.80 IN	SEATS 6 & 7 ARM 189.20 IN	SEAT 8 ARM 218.18 IN
	MOMENT (LBS · IN/100)						
100	49.20	81.30	96.25	102.80	136.80	189.20	218.18
110	54.12	89.43	105.88	113.08	150.48	208.12	240.00
120	59.04	97.56	115.50	123.36	164.16	227.04	261.82
130	63.96	105.69	125.13	133.64	177.84	245.96	283.63
140	68.88	113.82	134.75	143.92	191.52	264.88	305.45
150	73.80	121.95	144.38	154.20	205.20	283.80	327.27
160	78.72	130.08	154.00	164.48	218.88	302.72	349.09
170	83.64	138.21	163.63	174.76	232.56	321.64	370.91
180	88.56	146.34	173.25	185.04	246.24	340.56	392.72
190	93.48	154.47	182.88	195.32	259.92	359.48	414.54
200	98.40	162.60	192.50	205.60	273.60	378.40	436.36
210	103.32	170.73	202.13	215.88	287.28	397.32	458.18
220	108.24	178.86	211.75	226.16	300.96	416.27	480.00

WARNING

Seats 3 cannot be occupied during takeoff and landing when the P/N 160057-6 sidefacing 2-place low back divan is installed.
No seating limitations when the P/N 160057-8 or 160079-2 or AV10-3520-00 2-place sidefacing high back divan is installed, provided C.G. envelope is not exceeded.

NOTE

Seat 8 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.

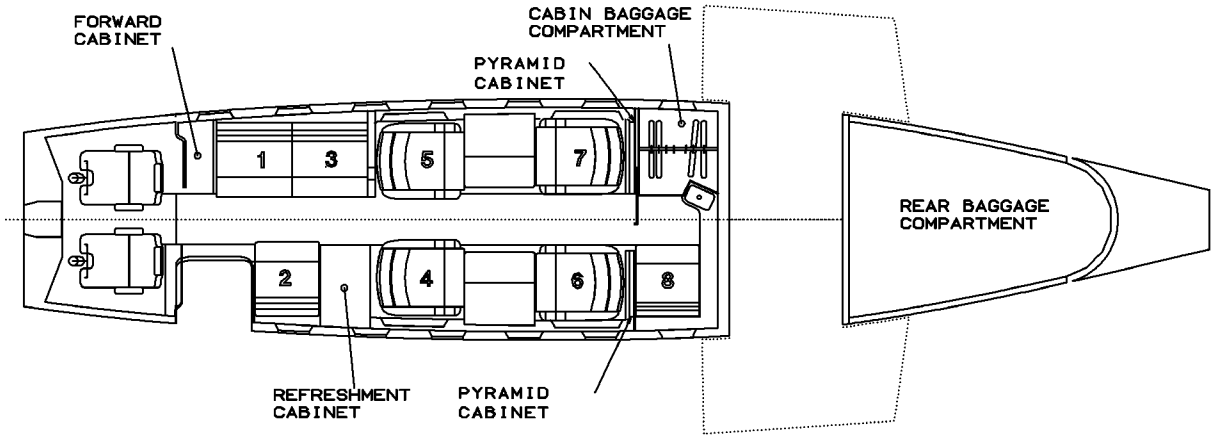


Figure 6-9. LOADING CHART-OCCUPANTS

BAGGAGE (OPTION # 1 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	REFRESHMENT CABINET FS 107 TO 131 ARM 116 IN
	MOMENT (LBS · IN/100)
5	5.80
10	11.60
15	17.40
20	23.20
25	29.00
30	34.80

WEIGHT LBS	PYRAMIDAL CABINET FS 200 TO 206 ARM 204 IN
	MOMENT (LBS · IN/100)
5	10.20
10	20.40

FM_6_10

Figure 6-10. LOADING CHART-BAGGAGE

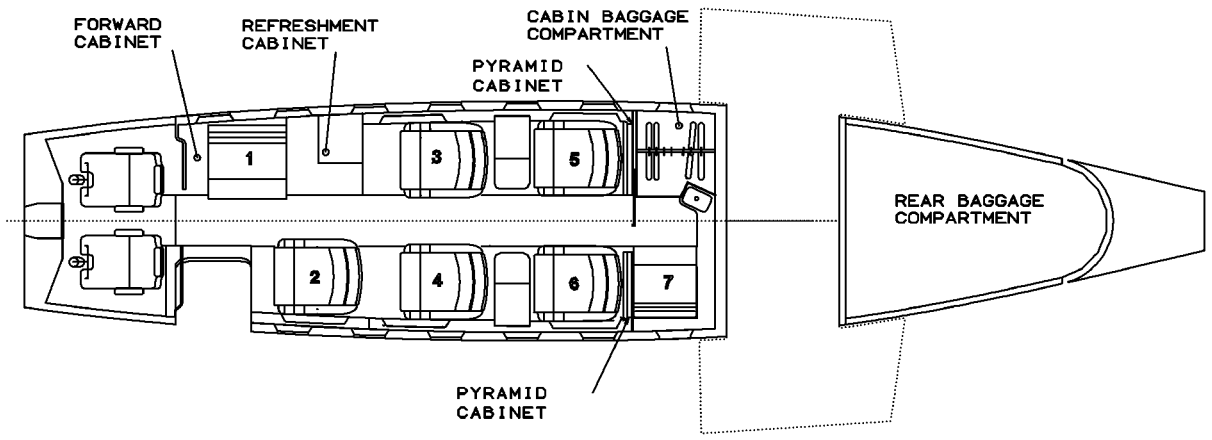
OCCUPANTS

OPTION # 4 CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 80.10 IN	SEAT 2 ARM 107.95 IN	SEATS 3 &4 ARM 148.66 IN	SEATS 5 & 6 ARM 189.04 IN	SEAT 7 ARM 218.18 IN
	MOMENT (LBS · IN/100)					
100	49.20	80.10	107.95	148.66	189.04	218.18
110	54.12	88.11	118.75	163.53	207.94	240.00
120	59.04	96.12	129.54	178.39	226.85	261.82
130	63.96	104.13	140.34	193.26	245.75	283.63
140	68.88	112.14	151.13	208.12	264.66	305.45
150	73.80	120.15	161.93	222.99	283.56	327.27
160	78.72	128.16	172.72	237.86	302.46	349.09
170	83.64	136.17	183.52	252.72	321.37	370.91
180	88.56	144.18	194.31	267.59	340.27	392.72
190	93.48	152.19	205.11	282.45	359.18	414.54
200	98.40	160.20	215.90	297.32	378.08	436.36
210	103.32	168.21	226.70	312.19	396.98	458.18
220	108.24	176.22	237.49	327.05	415.89	480.00

NOTE

Seat 7 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.



FM_6_11

Figure 6-11. LOADING CHART-OCCUPANTS

BAGGAGE (OPTION # 4 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	REFRESHMENT CABINET FS 91 TO 113 ARM 104 IN
	MOMENT (LBS · IN/100)
5	5.20
10	10.40
15	15.60
20	20.80
25	26.00
30	31.20

WEIGHT LBS	PYRAMIDAL CABINET FS 200 TO 206 ARM 204 IN
	MOMENT (LBS · IN/100)
5	10.20
10	20.40

Figure 6-12. LOADING CHART - BAGGAGE

FM_6_12

Figure 6-12. LOADING CHART-BAGGAGE

OCCUPANTS

OPTION # 6 CABIN CONFIGURATION

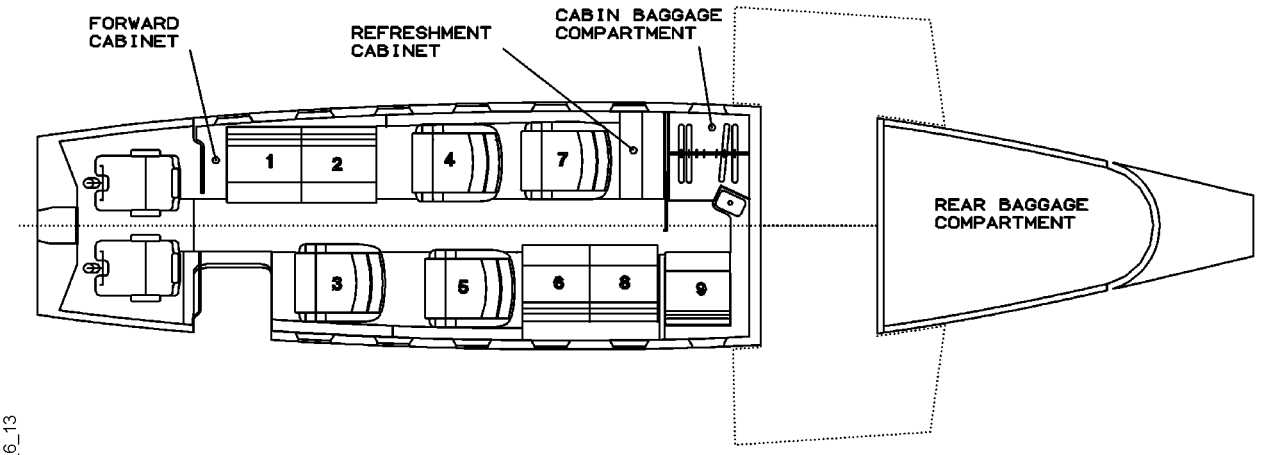
WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 81.30 IN	SEAT 2 ARM 102.80 IN	SEAT 3 ARM 107.66 IN	SEAT 4 ARM 141.82 IN	SEAT 5 ARM 144.66 IN	SEAT 6 ARM 173.75 IN	SEAT 7 ARM 178.82 IN	SEAT 8 ARM 195.25 IN	SEAT 9 ARM 218.18 IN
	MOMENT (LBS · IN/100)									
100	49.20	81.30	102.80	107.66	141.82	144.66	173.75	178.82	195.25	218.18
110	54.12	89.43	113.08	118.43	156.00	159.13	191.13	196.70	214.78	240.00
120	59.04	97.56	123.36	129.19	170.18	173.59	208.50	214.58	234.30	261.82
130	63.96	105.69	133.64	139.96	184.37	188.06	225.88	232.47	253.83	283.63
140	68.88	113.82	143.92	150.72	198.55	202.52	243.25	250.35	273.35	305.45
150	73.80	121.95	154.20	161.49	212.73	216.99	260.63	268.25	292.88	327.27
160	78.72	130.08	164.48	172.26	226.91	231.46	278.00	286.11	312.40	349.09
170	83.64	138.21	174.76	183.02	241.09	245.92	295.38	303.99	331.93	370.91
180	88.56	146.34	185.04	193.79	255.28	260.39	312.75	321.88	351.45	392.72
190	93.48	154.47	195.32	204.55	269.46	274.85	330.13	339.76	370.98	414.54
200	98.40	162.60	205.60	215.32	283.64	289.32	347.50	357.64	390.50	436.36
210	103.32	170.73	215.88	226.09	297.82	303.79	364.88	375.52	410.03	458.18
220	108.24	178.86	226.16	236.85	312.00	318.25	382.25	393.40	429.55	480.00

WARNING

Seats 2 and 8 cannot be occupied during takeoff and landing when the P/N 160057-6 sidefacing 2-place low back divans are installed.
No seating limitations when the P/N 160057-8 or 160079-2 or AV10-3520-00 2-place sidefacing high back front divan and P/N 160057-7 or 160079-3 2-place sidefacing high back aft divan are installed, provided C.G. envelope is not exceeded.

NOTE

Seat 9 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.



FM_6_13

Figure 6-13. LOADING CHART-OCCUPANTS

BAGGAGE (OPTION # 6 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	REFRESHMENT CABINET FS 186 TO 206 ARM 199 IN
	MOMENT (LBS · IN/100)
10	19.90
20	39.80
30	59.70
40	79.60
50	99.50
60	119.40
70	139.30
80	159.20
90	179.10
100	199.00
110	218.90
120	238.80
130	258.70
140	278.60
146.3	291.14

FM_6_14

Figure 6-14. LOADING CHART-BAGGAGE

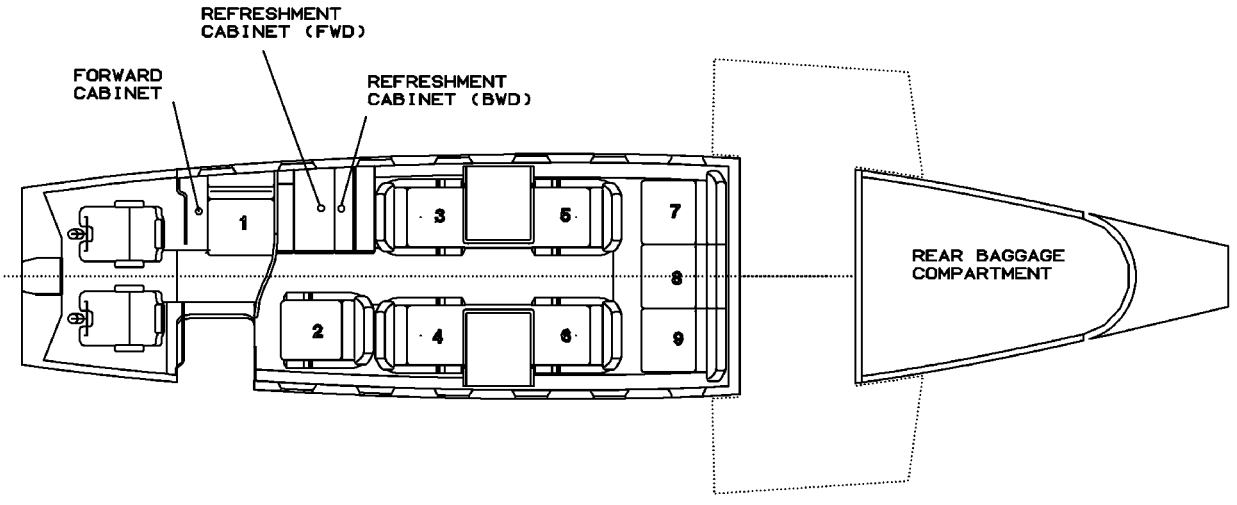
OCCUPANTS

OPTION # 7 CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 80.89 IN	SEAT 2 ARM 107.95 IN	SEATS 3 & 4 ARM 136.80 IN	SEATS 5 & 6 ARM 185.20 IN	SEAT 7, 8 & 9 ARM 221.29 IN
			MOMENT (LBS · IN/100)			
100	49.20	80.89	107.95	136.80	185.20	221.29
110	54.12	88.98	118.75	150.48	203.72	243.42
120	59.04	97.07	129.54	164.16	222.24	265.55
130	63.96	105.16	140.34	177.84	240.76	287.68
140	68.88	113.25	151.13	191.52	259.28	309.81
150	73.80	121.34	161.93	205.20	277.80	331.94
160	78.72	129.42	172.72	218.88	296.32	354.06
170	83.64	137.51	183.52	232.56	314.84	376.19
180	88.56	145.60	194.31	246.24	333.36	398.32
190	93.48	153.69	205.11	259.92	351.88	420.45
200	98.40	161.78	215.90	273.60	370.40	442.58
210	103.32	169.87	226.70	287.28	388.92	464.71
220	108.24	177.96	237.49	300.96	407.44	486.84

WARNING

When 9 passengers, 2 crew, and no baggage (in the rear baggage compartment) are on board, the pilot must carefully check the C.G. position.



FM_6_15

Figure 6-15. LOADING CHART-OCCUPANTS

BAGGAGE (OPTION # 7 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	REFRESHMENT CABINET (FWD) FS 97 TO 110 ARM 103.0 IN
	MOMENT (LBS · IN/100)
5	5.15
10	10.30
15	15.45
20	20.60
25	25.75
30	30.90
35	36.05
40	41.20
45	46.35
50	51.50
55	56.65
60	61.80
65	66.95
71	73.13

WEIGHT LBS	REFRESHMENT CABINET (BWD) FS 110 TO 123 ARM 116.2 IN
	MOMENT (LBS · IN/100)
5	5.81
10	11.62
15	17.43
20	23.24
25	29.05
30	34.86
35	40.67
40	46.48
45	52.29
50	58.10
55	63.91
60	69.72
65	75.73
71	82.50

FM_6_16

Figure 6-16. LOADING CHART-BAGGAGE

OCCUPANTS

OPTION # 3 CABIN CONFIGURATION

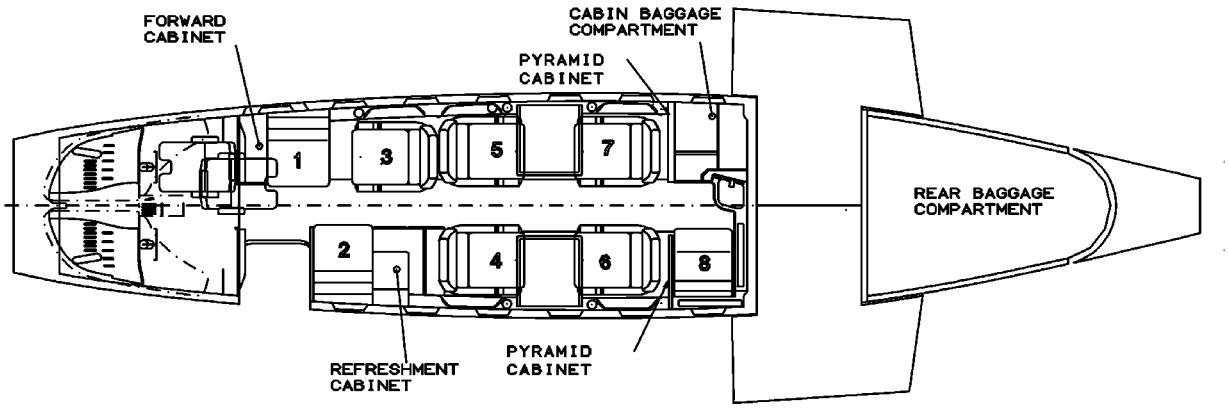
WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 81.05 IN	SEAT 2 ARM 96.25 IN	SEAT 3 ARM 113.96 IN	SEATS 4 & 5 ARM 142.80 IN	SEATS 6 & 7 ARM 189.20 IN	SEAT 8 ARM 218.18 IN
	MOMENT (LBS · IN/100)						
100	49.20	81.05	96.25	113.96	142.80	189.20	218.18
110	54.12	89.16	105.88	125.36	157.08	208.12	240.00
120	59.04	97.26	115.50	136.75	171.36	227.04	261.82
130	63.96	105.37	125.13	148.15	185.64	245.96	283.63
140	68.88	113.47	134.75	159.54	199.92	264.88	305.45
150	73.80	121.58	144.38	170.94	214.20	283.80	327.27
160	78.72	129.68	154.00	182.34	228.48	302.72	349.09
170	83.64	137.79	163.63	193.73	242.76	321.64	370.91
180	88.56	145.89	173.25	205.13	257.04	340.56	392.72
190	93.48	154.00	182.88	216.52	271.32	359.48	414.54
200	98.40	162.10	192.50	227.92	285.60	378.40	436.36
210	103.32	170.21	202.13	239.32	299.88	397.32	458.18
220	108.24	178.31	211.75	250.71	314.96	416.27	480.00

WARNING

When 8 passengers and 2 crew are on board the pilot must carefully check the C.G. position.

NOTE

Seat 8 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.



FM_6_17

Figure 6-17. LOADING CHART-OCCUPANTS

BAGGAGE (OPTION # 3 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	REFRESHMENT CABINET FS 107 TO 131 ARM 116 IN
	MOMENT (LBS · IN/100)
5	5.80
10	11.60
15	17.40
20	23.20
25	29.00
30	34.80

WEIGHT LBS	PYRAMIDAL CABINET FS 200 TO 206 ARM 204 IN
	MOMENT (LBS · IN/100)
5	10.20
10	20.40

FM_6_18

Figure 6-18. LOADING CHART-BAGGAGE

OCCUPANTS

STANDARD B CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 81.05 IN	SEAT 2 ARM 107.95 IN	SEAT 3 ARM 112.95 IN	SEAT 4 ARM 136.80 IN	SEATS 5 (*) ARM 141.80 IN	SEAT 6 & 7 ARM 189.20 IN	SEAT 8 ARM 218.18 IN
				MOMENT (LBS · IN/100)				
100	49.20	81.05	107.95	112.95	136.80	141.80	189.20	218.18
110	54.12	89.16	118.75	124.25	150.48	155.98	208.12	240.00
120	59.04	97.26	129.54	135.54	164.16	170.16	227.04	261.82
130	63.96	105.37	140.34	146.84	177.84	184.34	245.96	283.63
140	68.88	113.47	151.13	158.13	191.52	198.52	264.88	305.45
150	73.80	121.58	161.93	169.43	205.20	212.70	283.80	327.27
160	78.72	129.68	172.72	180.72	218.88	226.88	302.72	349.09
170	83.64	137.79	183.52	192.02	232.56	241.06	321.64	370.91
180	88.56	145.89	194.31	203.31	246.24	255.24	340.56	392.72
190	93.48	154.00	205.11	214.61	259.92	269.42	359.48	414.54
200	98.40	162.10	215.90	225.90	273.60	283.60	378.40	436.36
210	103.32	170.21	226.70	237.20	287.28	297.78	397.32	458.18
220	108.24	178.31	237.49	248.49	300.96	311.96	416.27	480.00

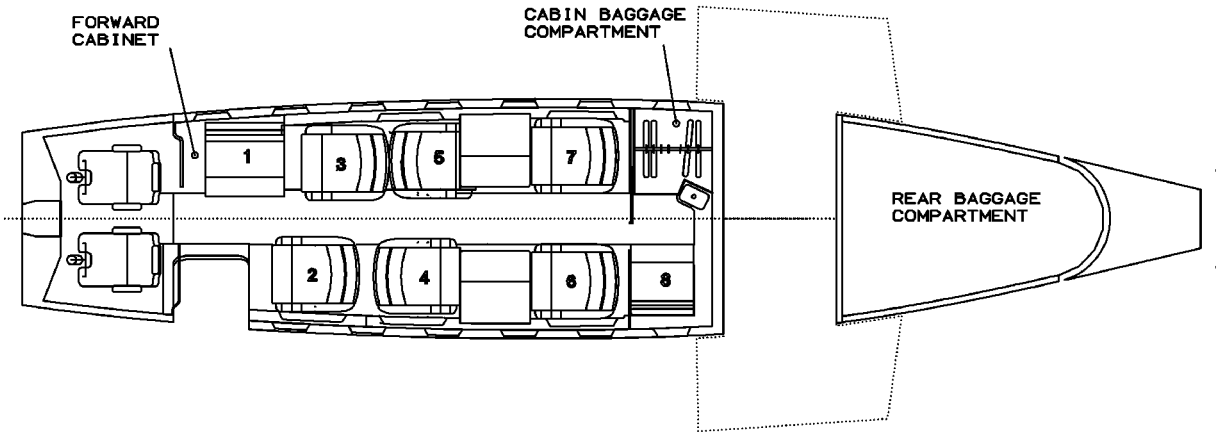
(*) Seat 5 moves to 136.80 in. Arm (same as seat 4) when seat 3 is removed for refreshment cabinet installation.

WARNING

When 8 passengers and 2 crew are on board the pilot must carefully check the C.G. position.

NOTE

Seat 8 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.



FM_6_19

Figure 6-19. LOADING CHART-OCCUPANTS

BAGGAGE (STANDARD B CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	REFRESHMENT (*) CABINET (FWD) FS 97 TO 110 ARM 103.0 IN
	MOMENT (LBS · IN/100)
5	5.15
10	10.30
15	15.45
20	20.60
25	25.75
30	30.90
35	36.05
40	41.20
45	46.35
50	51.50
55	56.65
60	61.80
65	66.95
71	73.13

WEIGHT LBS	REFRESHMENT (*) CABINET (BWD) FS 110 TO 123 ARM 116.2 IN
	MOMENT (LBS · IN/100)
5	5.81
10	11.62
15	17.43
20	23.24
25	29.05
30	34.86
35	40.67
40	46.48
45	52.29
50	58.10
55	63.91
60	69.72
65	75.73
71	82.50

(*) Can be installed after removal of seat 3.

FM_6_20

Figure 6-20. LOADING CHART-BAGGAGE

PIAGGIO AERO

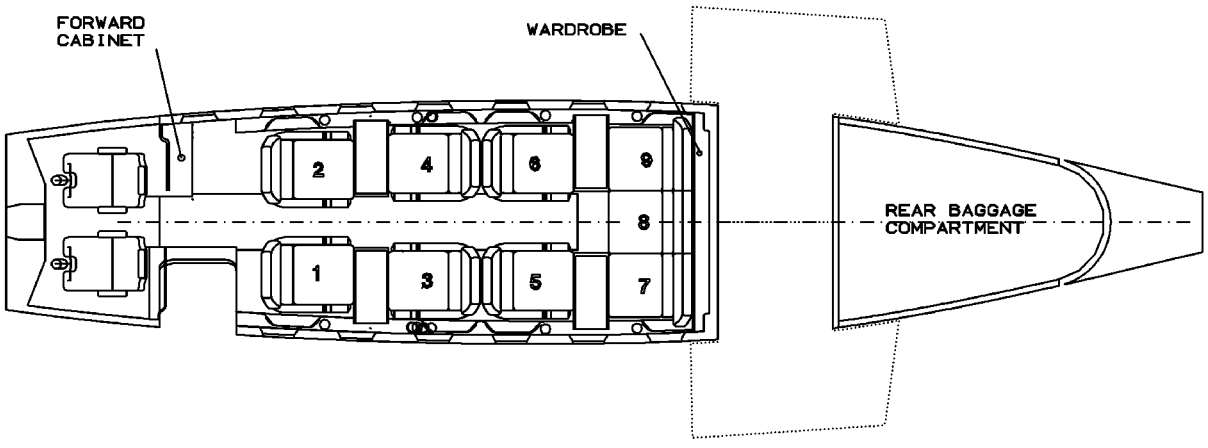
OCCUPANTS

OPTION # 8 CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEATS 1 & 2 ARM 106.54 IN	SEATS 3 & 4 ARM 146.16 IN	SEATS 5 & 6 ARM 175.33 IN	SEATS 7, 8 & 9 ARM 214.89 IN
	MOMENT (LBS · IN/100)				
100	49.20	106.54	146.16	175.33	214.89
110	54.12	117.19	160.78	192.86	236.38
120	59.04	127.85	175.39	210.40	257.87
130	63.96	138.50	190.01	227.93	279.36
140	68.88	149.16	204.62	245.46	300.85
150	73.80	159.81	219.24	263.00	322.34
160	78.72	170.46	233.86	280.53	343.82
170	83.64	181.12	248.47	298.06	365.31
180	88.56	191.77	263.09	315.59	386.80
190	93.48	202.43	277.70	333.13	408.29
200	98.40	213.08	292.32	350.66	429.78
210	103.32	223.73	306.94	368.19	451.27
220	108.24	234.39	321.55	385.73	472.76

WARNING

When 9 passengers and 2 crew are on board, the pilot must carefully check the C.G. position.



FM_6_21

Figure 6-21. LOADING CHART-OCCUPANTS

BAGGAGE (OPTION # 8 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	WARDROBE FS 228 TO 236 ARM 231.0 IN
	MOMENT (LBS · IN/100)
5	11.55
8	18.48

FM_6_22

Figure 6-22. LOADING CHART-BAGGAGE

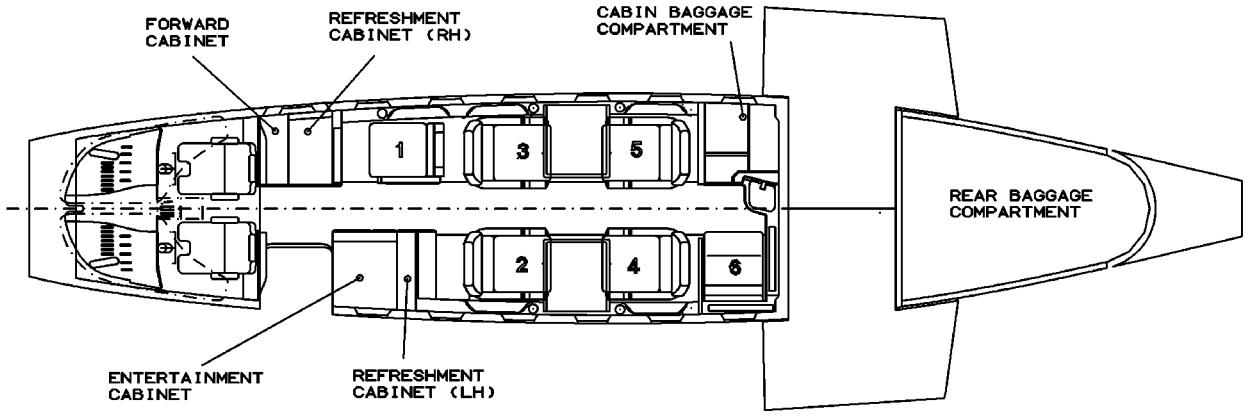
OCCUPANTS

OPTION # 9 CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 110.70 IN	SEAT 2 & 3 ARM 142.80 IN	SEAT 4 & 5 ARM 189.20 IN	SEATS 6 ARM 218.18 IN
	MOMENT (LBS · IN/100)				
100	49.20	110.70	142.80	189.20	218.18
110	54.12	121.77	157.08	208.12	240.00
120	59.04	132.84	171.36	227.04	261.82
130	63.96	143.91	185.64	245.96	283.63
140	68.88	154.98	199.92	264.88	305.45
150	73.80	166.05	214.20	283.80	327.27
160	78.72	177.12	228.48	302.72	349.09
170	83.64	188.19	242.76	321.64	370.91
180	88.56	199.26	257.04	340.56	392.72
190	93.48	210.33	271.32	359.48	414.54
200	98.40	221.40	285.60	378.40	436.36
210	103.32	232.47	299.88	397.32	458.18
220	108.24	243.54	314.96	416.27	480.00

NOTE

Seat 6 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.



FM_6_23

Figure 6-23. LOADING CHART-OCCUPANTS

BAGGAGE (OPTION # 9 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	REFRESHMENT CABINET (RH) FS 70 TO 85 ARM 77.8 IN
	MOMENT (LBS · IN/100)
10	7.78
20	15.56
30	23.34
40	31.12
53	41.23

WEIGHT LBS	REFRESHMENT CABINET (LH) FS 106 TO 120 ARM 112.5 IN
	MOMENT (LBS · IN/100)
10	11.25
20	22.50
30	33.75
40	45.00
50	56.25
60	67.50
69	77.63

WEIGHT LBS	ENTERTAINMENT CABINET FS 85 TO 106 ARM 97.0 IN
	MOMENT (LBS · IN/100)
10	9.70
20	19.40
30	29.10
40	38.80
50	48.50
60	58.20
70	67.90
80	77.60
90	87.30
100	97.00

FM_6_24

Figure 6-24. LOADING CHART-BAGGAGE

PIAGGIO AERO

OCCUPANTS

OPTION # 10 CABIN CONFIGURATION (*)

(*) Use these data for C.G. calculation when ERDA high comfort seats are installed as per Equipment List.

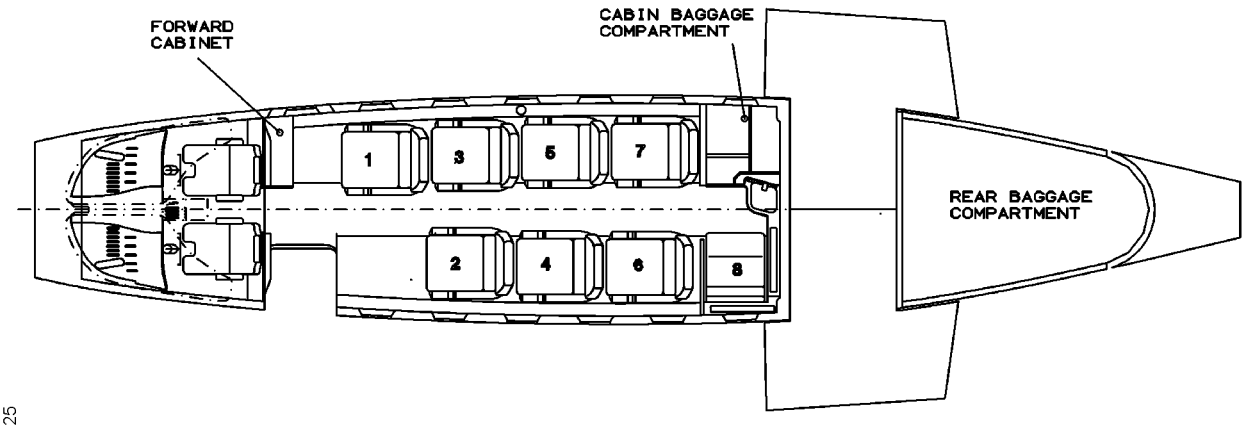
WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 101.50 IN	SEAT 2 ARM 129.70 IN	SEAT 3 ARM 131.50 IN	SEAT 4 ARM 159.70 IN	SEAT 5 ARM 161.50 IN	SEAT 6 ARM 189.70 IN	SEAT 7 ARM 191.50 IN	SEAT 8 ARM 218.18 IN
	MOMENT (LBS · IN/100)								
100	49.20	101.50	129.70	131.50	159.70	161.50	189.70	191.50	218.18
110	54.12	111.65	142.67	144.65	175.67	177.65	208.67	210.65	240.00
120	59.04	121.80	155.64	157.80	191.64	193.80	227.64	229.80	261.82
130	63.96	131.95	168.61	170.95	207.61	209.95	246.61	248.95	283.63
140	68.88	142.10	181.58	184.10	223.58	226.10	265.58	268.10	305.45
150	73.80	152.25	194.55	197.25	239.55	242.25	284.55	287.25	327.27
160	78.72	162.40	207.52	210.40	255.52	258.40	303.52	306.40	349.09
170	83.64	172.55	220.49	223.55	271.49	274.55	322.49	325.55	370.91
180	88.56	182.70	233.46	236.70	287.46	290.70	341.46	344.70	392.72
190	93.48	192.85	246.43	249.85	303.43	306.85	360.43	363.85	414.54
200	98.40	203.00	259.40	263.00	319.40	323.00	379.40	383.00	436.36
210	103.32	213.15	272.37	276.15	335.37	339.15	398.37	402.15	458.18
220	108.24	223.30	285.34	289.30	351.34	355.30	417.34	421.30	480.00

WARNING

When 8 passengers and 2 crew are on board, the pilot must carefully check the C.G. position.

NOTE

Seat 8 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.



FM_6_25

Figure 6-25. LOADING CHART-OCCUPANTS

INTENTIONALLY LEFT BLANK

PIAGGIO AERO

OCCUPANTS

OPTION # 10 CABIN CONFIGURATION (*)

(*) Use these data for C.G. calculation when ERDA or GEVEN light seats are installed as per Equipment List.

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 97.84 IN	SEAT 2 ARM 121.84 IN	SEAT 3 ARM 128.84 IN	SEAT 4 ARM 153.84 IN	SEAT 5 ARM 159.84 IN	SEAT 6 ARM 185.84 IN	SEAT 7 ARM 190.84 IN	SEAT 8 ARM 218.18 IN
	MOMENT (LBS · IN/100)								
100	49.20	97.84	121.84	128.84	153.84	159.84	185.84	190.84	218.18
110	54.12	107.62	134.02	141.72	169.22	175.82	204.42	209.92	240.00
120	59.04	117.41	146.21	154.60	184.61	191.81	223.01	229.01	261.82
130	63.96	127.19	158.39	167.49	199.99	207.79	241.59	248.09	283.63
140	68.88	136.98	170.58	180.38	215.38	223.78	260.18	267.18	305.45
150	73.80	146.76	182.76	193.26	230.76	239.76	278.76	286.26	327.27
160	78.72	156.54	194.94	206.14	246.14	255.74	297.34	305.34	349.09
170	83.64	166.33	207.13	219.03	261.53	271.73	315.93	324.43	370.91
180	88.56	176.11	219.31	231.91	276.91	287.71	334.51	343.51	392.72
190	93.48	185.90	231.50	244.80	292.30	303.70	353.10	362.60	414.54
200	98.40	195.68	243.68	257.68	307.68	319.68	371.68	381.68	436.36
210	103.32	205.46	255.86	270.56	323.06	335.66	390.26	400.76	458.18
220	108.24	215.25	268.05	283.45	338.45	351.65	408.85	419.85	480.00

WARNING

When 8 passengers and 2 crew are on board, the pilot must carefully check the C.G. position.

NOTE

Seat 8 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.

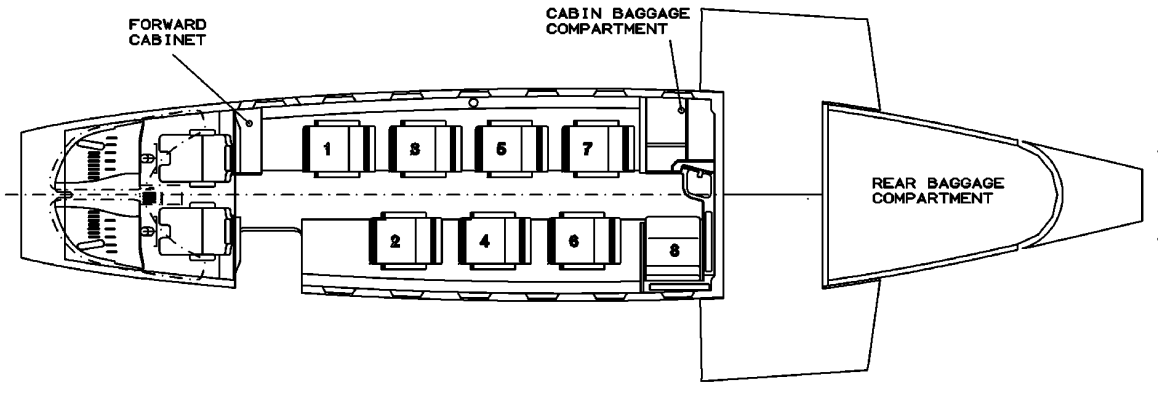


Figure 6-25/1. LOADING CHART-OCCUPANTS

BAGGAGE (OPTION # 10 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

FM_6_26

Figure 6-26. LOADING CHART-BAGGAGE

OCCUPANTS

OPTION # 5 CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEATS 1 & 2 ARM 107.13 IN	SEATS 3 & 4 ARM 137.35 IN	SEATS 5 & 6 ARM 185.13 IN	SEATS 7, 8 & 9 ARM 218.89 IN
	MOMENT (LBS · IN/100)				
100	49.20	107.13	137.35	185.13	218.89
110	54.12	117.84	151.09	203.64	240.78
120	59.04	128.56	164.82	222.16	262.67
130	63.96	139.27	178.56	240.67	284.56
140	68.88	149.98	192.29	259.18	306.45
150	73.80	160.70	206.03	277.70	328.34
160	78.72	171.41	219.76	296.21	350.22
170	83.64	182.12	233.50	314.72	372.11
180	88.56	192.83	247.23	333.23	394.00
190	93.48	203.55	260.97	351.75	415.89
200	98.40	214.26	274.70	370.26	437.78
210	103.32	224.97	288.44	388.77	459.67
220	108.24	235.69	302.17	407.29	481.56

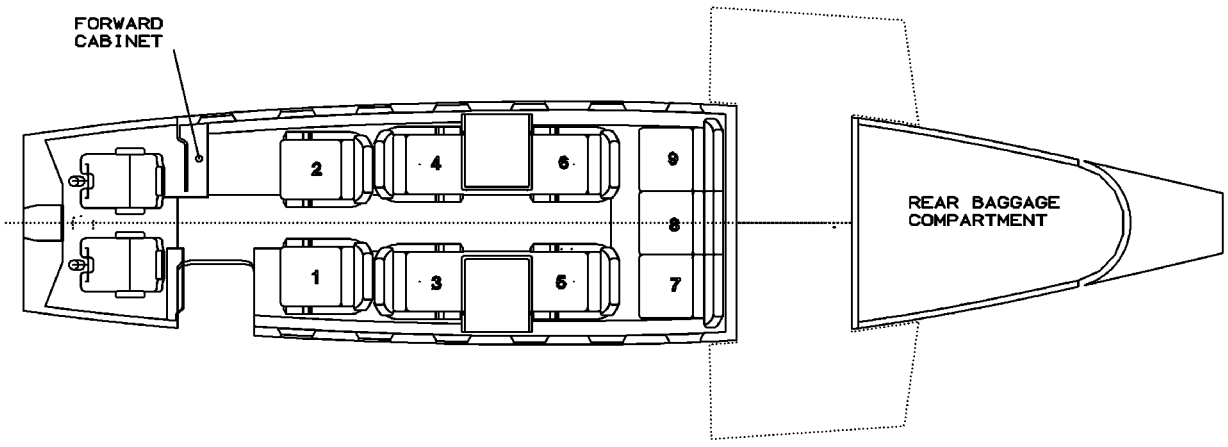


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Figure 6-27. LOADING CHART-OCCUPANTS

BAGGAGE (OPTION # 5 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

FM_6_28

Figure 6-28. LOADING CHART-BAGGAGE

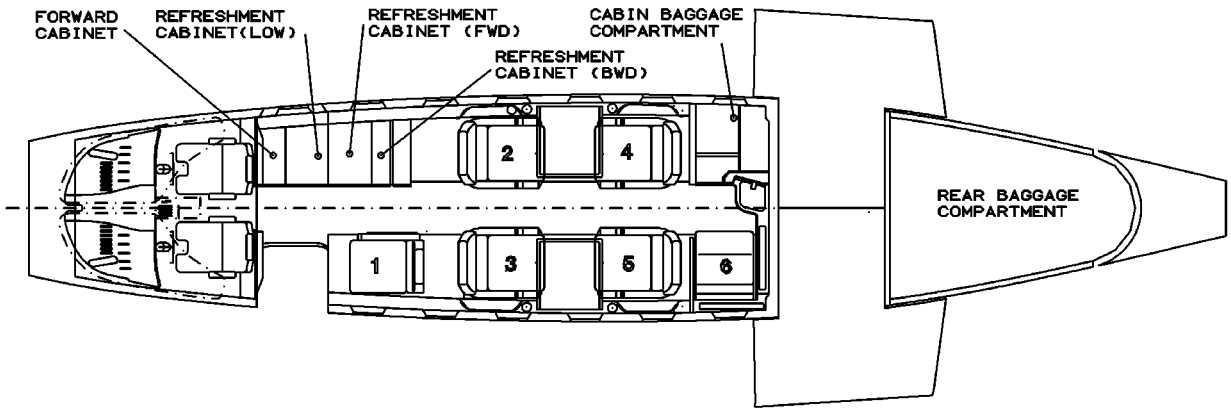
OCCUPANTS

OPTION # 11 CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 106.00 IN	SEAT 2 & 3 ARM 136.70 IN	SEAT 4 & 5 ARM 189.20 IN	SEATS 6 ARM 218.18 IN
	MOMENT (LBS · IN/100)				
100	49.20	106.00	136.70	189.20	218.18
110	54.12	116.60	150.37	208.12	240.00
120	59.04	127.20	164.04	227.04	261.82
130	63.96	137.80	177.71	245.96	283.63
140	68.88	148.40	191.38	264.88	305.45
150	73.80	159.00	205.05	283.80	327.27
160	78.72	169.60	218.72	302.72	349.09
170	83.64	180.20	232.39	321.64	370.91
180	88.56	190.80	246.06	340.56	392.72
190	93.48	201.40	259.73	359.48	414.54
200	98.40	212.00	273.40	378.40	436.36
210	103.32	222.60	287.07	397.32	458.18
220	108.24	233.20	300.74	416.27	480.00

NOTE

Seat 6 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.



FM_6_29

Figure 6-29. LOADING CHART-OCCUPANTS

BAGGAGE (OPTION # 11 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	REFRESHMENT CABINET (LOW) FS 70 TO 85 ARM 77.8 IN
	MOMENT (LBS · IN/100)
10	7.78
20	15.56
30	23.34
40	31.12
53	41.23

WEIGHT LBS	REFRESHMENT CABINET (FWD) FS 85 TO 98 ARM 91.2 IN
	MOMENT (LBS · IN/100)
10	9.12
20	18.24
30	27.36
40	36.48
50	45.60
60	54.72
71	64.75

WEIGHT LBS	REFRESHMENT CABINET (BWD) FS 98 TO 111 ARM 103.2 IN
	MOMENT (LBS · IN/100)
10	10.32
20	20.64
30	30.96
40	41.28
50	51.60
60	61.92
71	73.72

FM_6_30

Figure 6-30. LOADING CHART-BAGGAGE

OCCUPANTS

OPTION # 16 CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEATS 1 & 2 ARM 117.84 IN	SEATS 3 & 4 ARM 151.84 IN	SEATS 5 & 6 ARM 184.84 IN	SEAT 7 ARM 218.18 IN
	MOMENT (LBS · IN/100)				
100	49.20	117.84	151.84	184.84	218.18
110	54.12	129.62	167.02	203.32	240.00
120	59.04	141.41	182.21	221.81	261.82
130	63.96	153.19	197.39	240.29	283.63
140	68.88	164.98	212.58	258.78	305.45
150	73.80	176.76	227.76	277.26	327.27
160	78.72	188.54	242.94	295.74	349.09
170	83.64	200.33	258.13	314.23	370.91
180	88.56	212.11	273.31	332.71	392.72
190	93.48	223.90	288.50	351.20	414.54
200	98.40	235.68	303.68	369.68	436.36
210	103.32	247.46	318.86	388.16	458.18
220	108.24	259.25	334.05	406.65	480.00

NOTE

Seat 7 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.

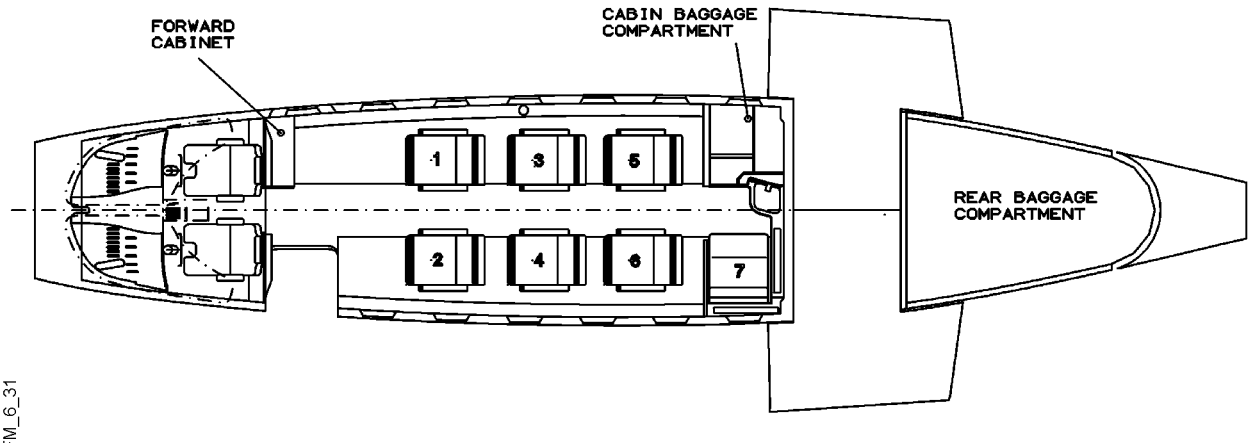


Figure 6-31. LOADING CHART-OCCUPANTS

BAGGAGE (OPTION # 16 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

FM_6_32

Figure 6-32. LOADING CHART-BAGGAGE

OCCUPANTS

OPTION # 2 CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEATS 1 & 2 ARM 107.13 IN	SEATS 3 & 4 ARM 137.35 IN	SEATS 5 & 6 ARM 189.13 IN	SEAT 7 ARM 218.18 IN
	MOMENT (LBS · IN/100)				
100	49.20	107.13	137.35	189.13	218.18
110	54.12	117.84	151.08	208.04	240.00
120	59.04	128.56	164.82	226.96	261.82
130	63.96	139.27	178.55	245.87	283.63
140	68.88	149.98	192.29	264.78	305.45
150	73.80	160.69	206.02	283.69	327.27
160	78.72	171.41	219.76	302.60	349.09
170	83.64	182.12	233.49	321.52	370.91
180	88.56	192.83	247.23	340.43	392.72
190	93.48	203.55	260.96	359.35	414.54
200	98.40	214.26	274.70	378.26	436.36
210	103.32	224.97	288.43	397.17	458.18
220	108.24	235.69	302.17	416.09	480.00

NOTE

Seat 7 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.

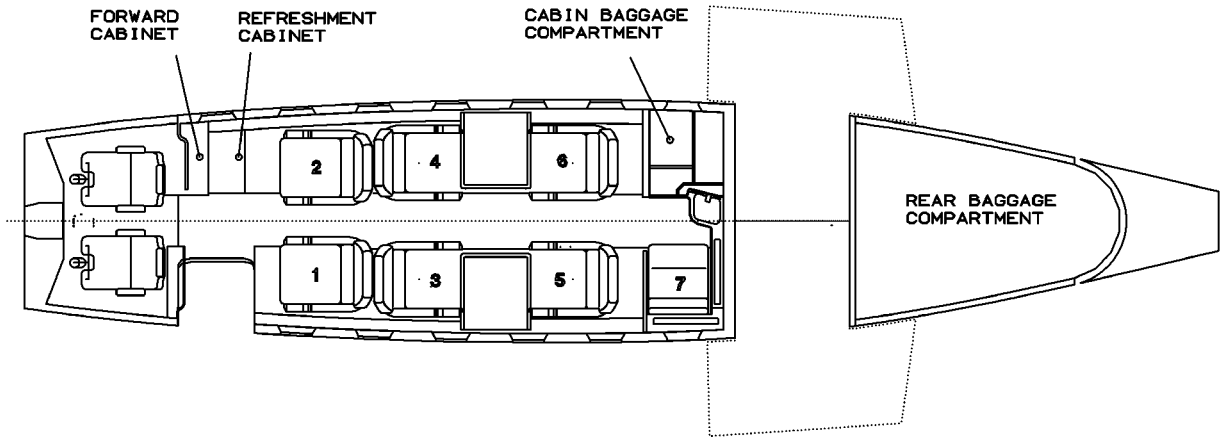


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Figure 6-33. LOADING CHART-OCCUPANTS

BAGGAGE (OPTION # 2 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	REFRESHMENT CABINET (FWD) FS 70 TO 81 ARM 75.8 IN
	MOMENT (LBS · IN/100)
5	3.78
10	7.58
14	10.61

WEIGHT LBS	REFRESHMENT CABINET, MIDSHIP (EACH) FS 114 TO 131 ARM 122.2 IN
	MOMENT (LBS · IN/100)
5	6.11
10	12.22
15	18.34
20	24.45
25	30.55

FM_6_34

Figure 6-34. LOADING CHART-BAGGAGE

OCCUPANTS

GREEN CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN
	MOMENT (LBS·IN/100)
100	49.20
110	54.12
120	59.04
130	63.96
140	68.88
150	73.80
160	78.72
170	83.64
180	88.56
190	93.48
200	98.40
210	103.32
220	108.24

NOTE

For the flight with one or two pilots only the use of ballast is required. Ballast amount depends on the fuel loading and must be evaluated individually. The ballast must be placed on the right and/or left side of the cabin at F.S. 97 in. (about 12 in. aft of the cabin door) and conveniently secured to the floor seat tracks by means of approved Baggage Restrain Nets, as per Page 6A-23 of the Equipment List.
In this configuration, no passengers are allowed.

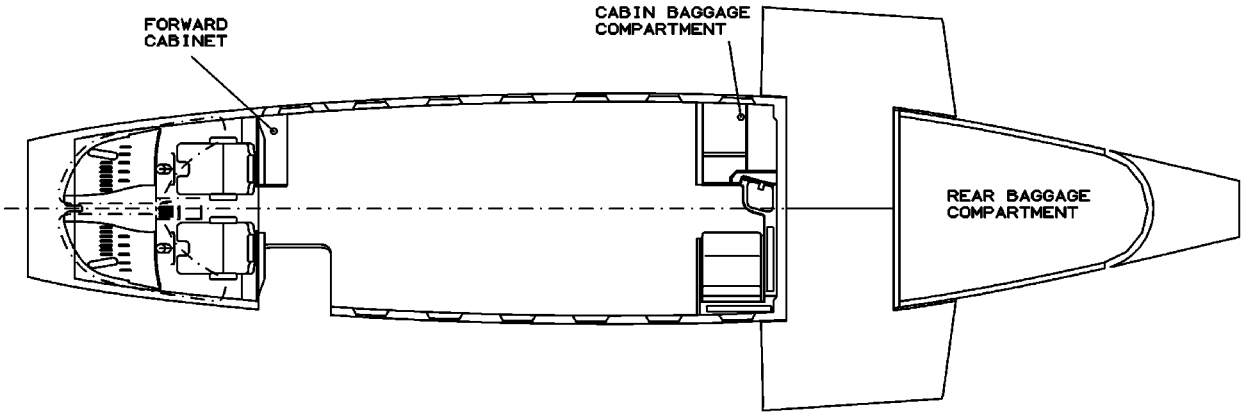

Figure 6-35. LOADING CHART - OCCUPANTS

BAGGAGE (GREEN CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

Figure 6-36. LOADING CHART - BAGGAGE

OCCUPANTS

OPTION # 19 CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 81.30 IN	SEAT 2 ARM 102.80 IN	SEAT 3 ARM 107.13 IN	SEATS 4 & 5 ARM 136.80 IN	SEATS 6 & 7 ARM 189.20 IN	SEAT 8 ARM 218.18 IN
MOMENT (LBS * IN/100)							
100	49.20	81.30	102.80	107.13	136.80	189.20	218.18
110	54.12	89.43	113.08	117.84	150.48	208.12	240.00
120	59.04	97.56	123.36	128.56	164.16	227.04	261.82
130	63.96	105.69	133.64	139.27	177.84	245.96	283.63
140	68.88	113.82	143.92	149.98	191.52	264.88	305.45
150	73.80	121.95	154.20	160.70	205.20	283.80	327.27
160	78.72	130.08	164.48	171.41	218.88	302.72	349.09
170	83.64	138.21	174.76	182.12	232.56	321.64	370.91
180	88.56	146.34	185.04	192.83	246.24	340.56	392.72
190	93.48	154.47	195.32	203.55	259.92	359.48	414.54
200	98.40	162.60	205.60	214.26	273.60	378.40	436.36
210	103.32	170.73	215.88	224.97	287.28	397.32	458.18
220	108.24	178.86	226.16	235.69	300.96	416.24	480.00

WARNING

Seats 3 cannot be occupied during takeoff and landing when the P/N 160057-6 sidefacing 2-place low back divan is installed.
No seating limitations when the P/N 160057-8 or 160079-2 or AV10-3520-00 sidefacing 2-place high back divan is installed, provided C.G. envelope is not exceeded.

NOTE

Seat 8 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.

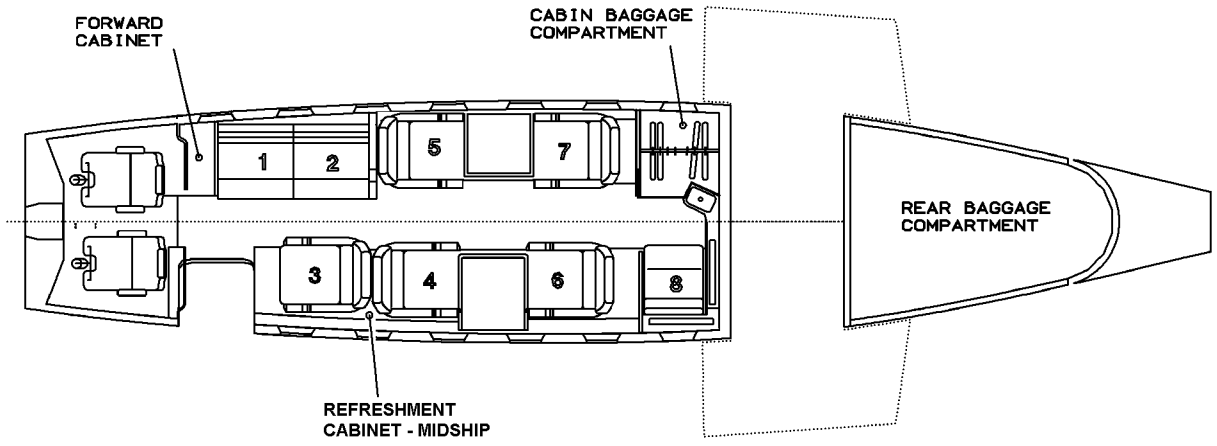

Figure 6-37. LOADING CHART - OCCUPANTS

BAGGAGE (OPTION # 19 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 2 8 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	REFRESHMENT CABINET - MIDSHIP FS 114 TO 131 ARM 122.2 IN
	MOMENT (LBS • IN/100)
5	6.11
10	12.22
15	18.34
20	24.45
25	30.55

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Figure 6-38. LOADING CHART-BAGGAGE

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6.5 EQUIPMENT LIST

The following is a list of equipment which may be installed in the airplane.
The items marked with an " X " were installed on the airplane described at the beginning of the list when licensed by the manufacturer and are included in the Basic Empty Weight. It is the owner's responsibility to retain this equipment list and amend it to reflect changes in equipment installed in this airplane.

EQUIPMENT LIST

P-180 AVANTI

Serial No.: _____ Registration No.: _____ Date: _____

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
21	**AIR CONDITIONING**					
21-20	DISTRIBUTION					
	- Shut-off E.C.S. Parker Hannifin Airborne Div. 24960-4	1.28 (ea.)	248.00	3.17	2	
	- Shut-off, Emergency Parker Hannifin Airborne Div. 27441482-03 or Dukes Inc. 5143-00-1	1.90	268.20	5.10	1	
	- Check Valve, Cabin Duct Hamilton Standard 750663-2	0.22	236.50	0.52	1	
21-30	PRESSURIZATION CONTROL					
	- Cabin Rate of Climb Indicator Aerosonic Corp. RCM60ACL2	0.87	19.70	0.17	1	
	- Cabin Alt. & Diff. Press. Indicator Aerosonic Corp. 55050-1168	0.64	19.70	0.13	1	
	- Static Port Aero Instrument Co. ST344-2GP	0.38 (ea.)	225.40	0.86	2	
	- Cabin Automatic Pressure Controller Allied S.A.C. 2117804-9	2.88	- 1.80	0.05	1	
	- Cabin Manual Pressure Controller Allied S.A.C. 131426-2	0.33	19.70	0.07	1	
	- Cabin Pressure Selector Allied S.A.C. 2117598-4	0.80	19.70	0.16	1	
	- Primary Outflow Valve Allied S.A.C. 103742-3 or Allied S.A.C. 103742-6	2.69	232.10	6.24	1	
	- Secondary Outflow Valve Allied S.A.C. 103744-3 or Allied S.A.C. 103744-6	2.73	232.10	6.34	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
	- Pressure Regulator EATON 83720-2 or Dukes 5146-00-1 or Dukes 5146-00-3	4.00	306.69	12.27	1	
21-40	HEATING					
	- Heat Exchanger ENVIRO 1320230-1	10.50	315.35	33.11	1	
	- Temperature Modulating Valve ENVIRO 1300330	2.30	303.36	6.98	2	
	- Acoustical Muffler ENVIRO 1300520-1	0.25	295.04	0.74	2	
	- Check Valve ENVIRO 1310150	0.25	235.04	0.59	2	
	- Duct Temperature Sensor ENVIRO 1300450-3	0.13	232.76	0.29	2	
	- Cabin Temperature Sensor ENVIRO 1300440	0.38	146.93	0.56	1	
	- Cockpit Temperature Sensor ENVIRO 1300440	0.38	39.96	0.15	1	
	- Temperature Switch ENVIRO 1300570-5	0.12	230.87	0.28	2	
	- Cabin Temperature Controller ENVIRO 1300350-19	0.71	136.10	0.97	1	
	- Cockpit Temperature Controller ENVIRO 1300350-20	0.71	0.00	0.00	1	
	- Ground Blower ENVIRO 1250435	7.65	306.10	23.42	1	
21-50	COOLING					
	- Refrigeration Pack Hamilton Standard 790421-1	35.50	306.70	108.88	1	

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ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
22	**AUTO FLIGHT**					
22-10	AUTOPILOT					
	- Autopilot Controller J.E.T. 501-1482-01	1.96	22.40	0.44	1	
	- Accelerometer NAC-80 Collins 229-0324-010	0.18	– 20.60	– 0.04	1	
	- Yaw Rate Sensor YRS-65 Collins 270-0930-010	0.75	– 18.30	– 0.14	1	
	- Autopilot Computer (APC-65A) Collins 622-7890-018 or Collins 622-7890-118	5.91	– 16.50	– 0.97	1	
	- Autopilot Computer Mount Collins 622-5213-001	0.51	– 16.50	– 0.08	1	
	- Slip Skid Sensor SSS-65 Collins 622-6019-001	0.44	– 14.60	– 0.06	1	
	- Aileron Servo SVO-65 Collins 622-5734-001	2.02	267.30	5.40	1	
	- Servo Mount SMT-65 Collins 622-5735-003	1.47	267.30	3.92	1	
	- Elevator Servo SVO-65 Collins 622-5734-001	2.02	387.00	7.82	1	
	- Servo Mount SMT-65 Collins 622-5735-003	1.47	387.00	5.69	1	
	- Rudder Servo SVO-65 Collins 622-5734-001	2.02	42.30	0.85	1	
	- Servo Mount SMT-65 Collins 622-5735-003	1.47	42.30	0.62	1	
	- Air Data Sensor Collins 622-5797-001	2.00	– 10.6	– 0.21	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
23	**COMMUNICATIONS**					
23-10	SPEECH COMMUNICATIONS					
	VHF COMM 1					
	- Transceiver VHF-22A Collins 622-6152 -001 or -011	4.57	– 16.50	– 0.75	1	
	with					
	- Control Unit CTL-22 Collins 622-6520-005	1.26	16.70	0.21	1	
	or					
	- Transceiver VHF-22C Collins 822-1113-001	4.57	– 16.50	– 0.75	1	
	with					
	- Control Unit CTL-22C Collins 822-1120-005	1.26	16.70	0.21	1	
	- Transceiver Mounting UMT-12 Collins 622-5212-001	0.44	– 16.50	– 0.07	1	
	- Antenna Granger VF10-347	1.50	215.90	3.24	1	
	VHF COMM 2					
	- Transceiver VHF-22A Collins 622-6152 -001 or -011	4.57 (1)	– 16.50 328.50	– 0.75 15.01	1	
	with					
	- Control Unit CTL-22 Collins 622-6520-005	1.26	16.70	0.21	1	
	or					
	- Transceiver VHF-22C Collins 822-1113-001	4.57 (1)	– 16.50 328.50	– 0.75 15.01	1	
	with					
	- Control Unit CTL-22C Collins 822-1120-005	1.26	16.70	0.21	1	
	- Transceiver Mounting UMT-12 Collins 622-5212-001	0.44 (1)	– 16.50 328.50	– 0.07 1.44	1	
	- Antenna Granger VF10-347	1.50	288.00	4.32	1	
	(1) Baggage Compartment Installation					

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
23	**COMMUNICATIONS**					
23-10	SPEECH COMMUNICATIONS (cont.)					
	VHF COMM 1					
	- Transceiver VHF-22D Collins 822-1114-001	4.70	328.50	15.44	1	
	with					
	- Control Unit CTL-22C Collins 822-1120-005	1.26	16.70	0.21	1	
	- Transceiver Mounting UMT-12 Collins 622-5212-001	0.44	328.50	1.44	1	
	- Antenna HR Smith 10-106-6	4.36	215.90	5.40	1	
	VHF COMM 2					
	- Transceiver VHF-22D Collins 822-1114-001	4.70	328.50	15.44	1	
	with					
	- Control Unit CTL-22C Collins 822-1120-005	1.26	16.70	0.21	1	
	- Transceiver Mounting UMT-12 Collins 622-5212-001	0.44	328.50	1.44	1	
	- Dual Installation Kit Collins 634-1103-003	0.33	328.50	1.08	1	
	- Antenna Sensor Systems S65-8280-10	2.80	288.00	8.06	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
23-10	SPEECH COMMUNICATIONS (cont.)					
	FLITEFONE (Optional) *GLOBAL WULFSBERG*					
	- Antenna AT-462 Global 121-14378-01	0.50	252.00	1.26	1	
	- Cabin Handset Control WH-10 Global 400-0123-xxx	1.40	164.00	2.30	1	
	- Cockpit Handset Control WH-10 Global 400-0123-xxx	1.40	48.90	0.70	1	
	- Transceiver RT-18D Global 400-0125-000	7.40	269.5	19.94	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
23-30	CABIN ENTERTAINMENT					
	STEREO SYSTEM (Optional)					
	- Audio Distribution Unit Pacific Systems 653-1-50	2.90	228.00	6.61	1	
	- DC/DC Converter KGS LT-71A	1.50	219.90	3.30	1	
	- Audio Power Amplifier Pacific Systems 656-1-1	0.88	211.90	1.86	1	
	available with either:					
	Option 1:					
	- AM/FM/Cassette Player Sony XR-7180	4.20	211.90	8.90	1	
	and					
	- AM/FM Antenna Comant CI222	0.50	297.00	1.48	1	
	or:					
	Option 2:					
	- CD Remote Changer Alpine Model 5959	6.00	220.00	13.20	1	
	and					
	- CD Changer Control System Alpine Model 5953					
	a. Controller	0.50	180.00	0.90	1	
	b. Audio Box	1.00	220.00	2.20	1	
	CABIN DISPLAY (Optional)					
	- Cabin Display B&D 2504-0xxx	0.50	50.00	0.25	1	
	- Computer Unit B&D 2504-1ET	1.50	0.00	–	1	
	- Transducer B&D 2504-900ET	0.50	0.00	–	1	
	- OAT Probe B&D 2504-600	0.10	59.70	0.06	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
23-50	AUDIO					
	- Audio Panel, cockpit Baker M1035-JHMB-XXXX or Baker B1035-JHMB-XXXX or Baker B1035-JHMJ-XXXX or Baker 990-3334-382 or Baker 990-3334-383 or Baker 990-3334-393	2.00 (ea.)	16.00	0.32	2	
	- Headset, cockpit Telex 64300-000	1.00 (ea.)	18.60	0.19	2	
	- Cockpit Speaker Irel E11-54X5783-6	1.76 (ea.)	18.60	0.33	2	
	- Cabin Speaker Irel E11-54X5783-6	1.76 (ea.)	125.00	2.20	2	
	- Cabin Speaker Irel E11-54X5783-6	1.76 (ea.)	171.00	3.01	2	
	- Hand Microphone Telex 66T or Telex 66TRA	0.55 (ea.)	18.60	0.10	2	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
24	**ELECTRICAL POWER**					
24-20	AC GENERATION					
	- Inverter Avionic Instrument 1B250-1D-1 or Marathon PC-251-123G	4.46 (ea.)	– 21.60	– 0.96	2	
	- Control Unit, AC Pacific Systems 280-1-2 or Sirio Panel 727-0445/01	0.85	– 11.00	– 0.09	1	
24-30	DC GENERATION					
	- Starter Generator Lear Siegler Inc. 23080-019	34.70 (ea.)	261.20	90.63	2	
	- Adapter Lear Siegler Inc. 23080-504	1.40 (ea.)	262.60	3.67	2	
	- Generator Control Panel Lear Siegler Inc. 51539-013C	2.40 (ea.)	267.30	6.42	2	
	- Battery Marathon Battery Co. 31055-001	75.00	269.20	201.90	1	
	or Saft D412764	84.20	269.20	226.67	1	
	- Relay Hartman A703R	2.03 (ea.)	270.00	5.48	6	
	14 Vdc AUXILIARY POWER (Optional)					
	- DC/DC Power Converter KGS Electronics LT-71A	1.73	224.00	3.88	1	

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ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25	**EQUIPMENT/FURNISHINGS**					
25-10	FLIGHT COMPARTMENT					
	- Pilot Seat ERDA 303343-1 or ERDA 303343-3	36.00	49.20	17.70	1	
	- Copilot Seat ERDA 303343-2 or ERDA 303343-4	36.00	49.20	17.70	1	
25-20	PASSENGER COMPARTMENT					
	- Pyramid Cabinet (LH) (Optional) Piaggio 80-909612	10.5	204.00	21.42	1	
	- Pyramid Cabinet (RH) (Optional) Piaggio 80-909610	11.3	204.00	23.05	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER		WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)						
	OPTION # 2 CABIN CONFIGURATION						
	- Fwd facing seat (LH)						
	ERDA 303267-43	(1)	42.00	107.13	44.99	1	
	GEVEN AV08-1101-00	(2)	58.42	107.13	62.58	1	
	- Fwd facing seat (RH)						
	ERDA 303267-44	(1)	42.00	107.13	44.99	1	
	GEVEN AV08-2101-00	(2)	58.42	107.13	62.58	1	
	- Aft facing seat (LH)						
	ERDA 303267-1	(1)	42.00	137.35	57.68	1	
	GEVEN AV09-1114-00	(2)	61.73	137.35	84.79	1	
	- Aft facing seat (RH)						
	ERDA 303267-2	(1)	42.00	137.35	57.68	1	
	GEVEN AV09-2114-00	(2)	61.73	137.35	84.79	1	
	- Fwd facing seat (LH)						
	ERDA 303267-3	(1)	42.00	189.13	79.43	1	
	GEVEN AV08-1101-00	(2)	58.42	189.13	99.14	1	
	- Fwd facing seat (RH)						
	ERDA 303267-4	(1)	42.00	189.13	79.43	1	
	GEVEN AV08-2101-00	(2)	58.42	189.13	99.14	1	
	- Refreshment Cabinet Piaggio 80-909842-801		13.20	75.78	10.00	1	
	- Refreshment Cabinet (midship) Piaggio 80-909771-805		20.20	122.16	24.68	1	
	and						
	- Refreshment Cabinet (midship) Piaggio 80-909771 -807 or -809		14.30	122.16	17.46	1	
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model FM installed as separate P/N.						
	(2) Seat Belts weight included.						

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)					
	STANDARD CABIN CONFIGURATION					
	- One place divan (1) ERDA 160053-2	23.50	82.05	19.28	1	
	- Fwd facing seat (LH) (1) ERDA 303267-43	42.00	107.95	45.34	1	
	- Aft facing seat (LH) (1) ERDA 303267-1	42.00	136.80	57.46	1	
	- Aft facing seat (RH) (1) ERDA 303267-2	42.00	136.80	57.46	1	
	- Fwd facing seat (LH) (1) ERDA 303267-3	42.00	189.20	79.46	1	
	- Fwd facing seat (RH) (1) ERDA 303267-4	42.00	189.20	79.46	1	
	- Refreshment Cabinet Piaggio 80-909621-806	60.00	105.75	63.45	1	
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N.					

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)					
	STANDARD B CABIN CONFIGURATION					
	- One place divan (1) ERDA 160053-2	23.50	81.05	19.15	1	
	- Fwd facing seat (LH) (1) ERDA 303267-43	42.00	107.95	45.34	1	
	- Fwd facing seat (RH) (1) (a) ERDA 303267-44	42.00	112.95	47.44	1	
	or					
	- Refreshment Cabinet (FWD) (a) Piaggio 80-909745-801	21.50	103.00	22.15	1	
	with					
	- Refreshment Cabinet (BWD) (a) Piaggio 80-909745-803	23.50	116.20	27.31	1	
	- Aft facing seat (LH) (1) ERDA 303267-1	42.00	136.80	57.46	1	
	- Aft facing seat (RH) (1) (b) ERDA 303267-2	42.00	141.80 136.80	59.56 57.46	1	
	- Fwd facing seat (LH) (1) ERDA 303267-3	42.00	189.20	79.46	1	
	- Fwd facing seat (RH) (1) ERDA 303267-4	42.00	189.20	79.46	1	
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N.					
	(a) The refreshment cabinets can be installed after removal of the seat.					
	(b) Move this seat to 136.80 in. arm when installing the refreshment cabinets.					

ATA No.	ITEM DESCRIPTION AND PART NUMBER		WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)						
	OPTION # 1 CABIN CONFIGURATION						
	- Two place divan (low back) ERDA 160057-6	(2)	46.00	88.15	40.55	1	
	or						
	- Two place divan (high back) ERDA 160057-8 or 160057-15	(3)	50.00	88.15	44.08	1	
	or						
	- Two place divan (high back) ERDA 160079-2	(3)	48.00	88.15	42.31	1	
	or						
	- Two place divan (high back) GEVEN AV10-3520-00	(3)	48.00	88.15	42.31	1	
	- One place divan ERDA 160046-1	(1)	24.00	96.25	23.10	1	
	or						
	- One place divan (high back) ERDA 160046-3	(1)	25.00	96.25	24.06	1	
	GEVEN AV11-3521-00	(1)	21.83	96.25	21.01	1	
	- Aft facing seat (LH)						
	ERDA 303267-1	(1)	42.00	136.80	57.46	1	
	GEVEN AV09-1114-00	(4)	61.73	136.80	84.45	1	
	- Aft facing seat (RH)						
	ERDA 303267-2	(1)	42.00	136.80	57.46	1	
	GEVEN AV09-2114-00	(4)	61.73	136.80	84.45	1	
	- Fwd facing seat (LH)						
	ERDA 303267-3	(1)	42.00	189.20	79.46	1	
	GEVEN AV08-1101-00	(4)	58.42	189.20	110.53	1	
	- Fwd facing seat (RH)(1)						
	ERDA 303267-4	(1)	42.00	189.20	79.46	1	
	GEVEN AV08-2101-00	(4)	58.42	189.20	110.53	1	
	- Refreshment Cabinet						
	Piaggio 80-909621-805 or -807		60.00	119.00	71.40	1	
	or						
	Piaggio 80-909621-809		65.00	119.00	77.35	1	
	or						
	Piaggio 80-909621-811		66.14	119.00	78.71	1	
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N. (2) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed on both the seats as separate P/N. (3) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 or Model 55 installed on the forward seat and Shoulder Harness Double Strap Model 55 installed on the rear seat as separate P/N. (4) Seat Belts weight included.						

ATA No.	ITEM DESCRIPTION AND PART NUMBER		WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)						
	OPTION # 3 CABIN CONFIGURATION						
	- One place divan (RH) ERDA 160053-2	(1)	24.00	81.05	19.45	1	
	- One place divan (LH) ERDA 160046-1	(1)	24.00	96.25	23.10	1	
	- Fwd facing seat (RH) ERDA 303267-44	(1)	42.00	113.96	47.86	1	
	- Aft facing seat (LH) ERDA 303267-1	(1)	42.00	142.80	59.98	1	
	- Aft facing seat (RH) ERDA 303267-2	(1)	42.00	142.80	59.98	1	
	- Fwd facing seat (LH) ERDA 303267-3	(1)	42.00	189.20	79.46	1	
	- Fwd facing seat (RH) ERDA 303267-4	(1)	42.00	189.20	79.46	1	
	- Refreshment Cabinet Piaggio 80-909621-805 or Piaggio 80-909621-807		60.00	119.00	71.40	1	
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N.						

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)					
	OPTION # 4 CABIN CONFIGURATION					
	- One place divan (1) ERDA 160053-2	23.50	80.10	18.82	1	
	- Fwd facing seat (LH) (1) ERDA 303267-45	42.00	107.95	45.34	1	
	- Fwd facing seat (LH) (1) ERDA 303267-9	42.00	148.66	62.44	1	
	- Fwd facing seat (RH) (1) ERDA 303267-10	42.00	148.66	62.44	1	
	- Fwd facing seat (LH) (1) ERDA 303267-7	42.00	189.04	79.40	1	
	- Fwd facing seat (RH) (1) ERDA 303267-8	42.00	189.04	79.40	1	
	- Refreshment Cabinet Piaggio 80-909589-801	161.50	102.00	164.73	1	
	- Magazine Rack Piaggio 80-909592-801	3.00	206.00	6.18	1	
	- Soda Cabinets Piaggio 80-909591-801/802	8.00 (ea.)	201.00	16.10	2	
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N.					

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)					
	OPTION # 5 CABIN CONFIGURATION					
	- Fwd facing seat (LH) (1) ERDA 303267-43 or ERDA 303453-3	42.00	107.13	44.99	1	
	- Fwd facing seat (RH) (1) ERDA 303267-44 or ERDA 303453-4	42.00	107.13	44.99	1	
	- Aft facing seat (LH) (1) ERDA 303267-1	42.00	137.35	57.69	1	
	- Aft facing seat (RH) (1) ERDA 303267-2	42.00	137.35	57.69	1	
	- Fwd facing seat (LH) (1) ERDA 303267-9	42.00	185.13	77.75	1	
	- Fwd facing seat (RH) (1) ERDA 303267-10	42.00	185.13	77.75	1	
	- Three place divan (1) ERDA 160072-1	75.00	218.89	164.17	1	
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N.					

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)					
	OPTION # 6 CABIN CONFIGURATION					
	- Two place divan (low back) (2) ERDA 160057-6	46.00	92.00	42.32	1	
	or					
	- Two place divan (high back) (3) ERDA 160057-8 or 160057-15	50.00	92.00	46.00	1	
	or					
	- Two place divan (high back) (3) ERDA 160079-2	48.00	92.00	44.16	1	
	or					
	- Two place divan (high back) (3) GEVEN AV10-3520-00	48.00	88.15	42.31	1	
	- Fwd facing seat (LH) (1) - ERDA 303267-9	42.00	107.66	45.22	1	
	- Fwd facing seat (RH) (1) ERDA 303267-8	42.00	141.82	59.56	1	
	- Fwd facing seat (LH) (1) ERDA 303267-45	42.00	144.66	60.76	1	
	- Fwd facing seat (RH) (1) ERDA 303267-10	42.00	178.82	75.10	1	
	- Two place divan (low back) (2) ERDA 160057-6	46.00	184.50	84.87	1	
	or					
	- Two place divan (high back) (4) ERDA 160057-7	50.00	184.50	92.25	1	
	or					
	- Two place divan (high back) (4) ERDA 160079-3	48.00	184.50	88.56	1	
	- Refreshment Cabinet Piaggio 80-909710-801	35.28	199.00	70.21	1	
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N. (2) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed on both the seats as separate P/N. (3) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 or Model 55 installed on the forward seat and Shoulder Harness Double Strap Model 55 installed on the rear seat as separate P/N. (4) AIRCRAFT BELTS Inc. Shoulder Harness Double Strap Model 55 installed on both the seats as separate P/N.					

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)					
	OPTION # 7 CABIN CONFIGURATION					
	- Fwd facing seat (LH) (1) ERDA 303267-43	42.00	107.95	45.34	1	
	- Aft facing seat (LH) (1) ERDA 303267-1	42.00	136.80	57.46	1	
	- Aft facing seat (RH) (1) ERDA 303267-2	42.00	136.80	57.46	1	
	- Fwd facing seat (LH) (1) ERDA 303267-9	42.00	185.20	77.78	1	
	- Fwd facing seat (RH) (1) ERDA 303267-10	42.00	185.20	77.78	1	
	- Three place divan (1) ERDA 160057-6	75.00	221.29	165.89	1	
	- Privacy curtain cabinet Piaggio 80-909676-401	25.00	94.00	23.50	1	
	- Refreshment Cabinet (FWD) Piaggio 80-909745-801	21.50	103.00	22.15	1	
	- Refreshment Cabinet (BWD) Piaggio 80-909745-803	23.50	116.20	27.31	1	
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N.					

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)					
	OPTION # 8 CABIN CONFIGURATION					
	- Aft facing seat (LH) (1) ERDA 303453-3 or ERDA 303267-47	42.00	106.54	44.75	1	
	- Aft facing seat (RH) (1) ERDA 303453-4 or ERDA 303267-48	42.00	106.54	44.75	1	
	- Aft facing seat (LH) (1) ERDA 303267-3	42.00	146.16	61.39	1	
	- Aft facing seat (RH) (1) ERDA 303267-4	42.00	146.16	61.39	1	
	- Fwd facing seat (LH) (1) ERDA 303267-1	42.00	175.33	73.64	1	
	- Fwd facing seat (RH) (1) ERDA 303267-2	42.00	175.33	73.64	1	
	- Three place divan (1) ERDA 160072-1	75.00	214.89	161.17	1	
	- Wardrobe Piaggio 80-909748-801	30.00	231.00	69.30	1	
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N.					

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)					
	OPTION # 9 CABIN CONFIGURATION					
	- Fwd facing seat (RH) (1) ERDA 303453-3 or ERDA 303453-4 or ERDA 303267-44	42.00	110.70	46.49	1	
	- Aft facing seat (LH) (1) ERDA 303267-1	42.00	142.80	59.98	1	
	- Aft facing seat (RH) (1) ERDA 303267-2	42.00	142.80	59.98	1	
	- Fwd facing seat (LH) (1) ERDA 303267-3	42.00	189.20	79.46	1	
	- Fwd facing seat (RH) (1) ERDA 303267-4	42.00	189.20	79.46	1	
	- Refreshment Cabinet (RH) Piaggio 80-909669-801	30.00	77.80	23.34	1	
	- Entertainment cabinet Piaggio 80-909749-801 weight including	120.00	97.00	116.40	1	
	- LCD Monitor (FWD) ASINC Inc. 914035-2	7.00	97.00	6.79	1	
	- Refreshment cabinet (LH) Piaggio 80-909749-801	30.00	112.50	33.75	1	
	- LCD Monitor (BWD) ASINC Inc. 914035-1	7.00	204.80	14.34	1	
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N.					

ATA No.	ITEM DESCRIPTION AND PART NUMBER		WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)						
	OPTION # 10 CABIN CONFIGURATION						
	- Fwd facing seat (RH)					1	
	ERDA 303267-16	(1)(2)	43.00	101.50	43.65		
	ERDA 303558-12	(3)	29.00	97.84	28.37		
	GEVEN AV03-2102-01	(5)	29.80	97.84	29.12		
	- Fwd facing seat (LH)					1	
	ERDA 303267-15	(1)(2)	43.00	129.70	55.77		
	ERDA 303558-11	(3)	29.00	121.84	35.33		
	GEVEN AV03-1102-01	(5)	29.80	121.84	36.27		
	- Fwd facing seat (RH)					1	
	ERDA 303267-14	(1)(2)	43.00	131.50	56.55		
	ERDA 303558-14	(3)	29.00	128.84	37.36		
	GEVEN AV03-2101-01	(5)	29.80	128.84	38.35		
	- Fwd facing seat (LH)					1	
	ERDA 303267-11	(1)(2)	43.00	159.70	68.67		
	ERDA 303558-13	(3)	29.00	153.84	44.61		
	GEVEN AV03-1101-01	(5)	29.80	153.84	45.79		
	- Fwd facing seat (RH)					1	
	ERDA 303267-12	(1)(2)	43.00	161.50	69.45		
	ERDA 303558-14	(3)	29.00	159.84	46.35		
	GEVEN AV03-2101-01	(5)	29.80	159.84	47.58		
	- Fwd facing seat (LH)					1	
	ERDA 303267-3	(1)(2)	43.00	189.70	81.57		
	ERDA 303558-15	(3)	29.00	185.84	53.89		
	GEVEN AV03-1113-01	(5)	29.80	185.84	55.32		
	- Fwd facing seat (RH)					1	
	ERDA 303267-4	(1)(2)	43.00	191.50	82.35		
	ERDA 303558-16	(3)	29.00	190.84	55.34		
	GEVEN AV03-2113-01	(5)	29.80	190.84	56.81		
	- Carpet Assembly Piaggio Dwg. 80-909544	(4)	55.00	134.00	73.70	1	
	TOTAL OPTION # 10	(2)	356.00	149.35	531.69		
		(3)	258.00	145.34	374.97		
		(5)	263.37	145.63	383.54		
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N (Belt weight included in seat weight)						
	(2) Arrangement with high comfort seats.						
	(3) Arrangement with light seats (Belt weight included in seat weight).						
	(4) Including cockpit and rear baggage compartment carpets.						
	(5) Arrangement as per Piaggio drawing 80-909731-851 (Belt weight included).						

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)					
	OPTION # 11 CABIN CONFIGURATION					
	- Fwd facing seat (LH) (1) ERDA 303453-4 or ERDA 303267-45	46.00	106.00	48.76	1	
	- Aft facing seat (LH) (1) ERDA 303267-11 or ERDA 303267-1	43.00	136.70	58.78	1	
	- Aft facing seat (RH) (1) ERDA 303267-12 or ERDA 303267-2	43.00	136.70	58.78	1	
	- Fwd facing seat (LH) (1) ERDA 303267-3	43.00	189.20	81.36	1	
	- Fwd facing seat (RH) (1) ERDA 303267-4	43.00	189.20	81.36	1	
	- Card Table Piaggio 80-909605-805	12.00 (ea.)	163.00	19.56	2	
	- Refreshment Cabinet (LOW) Piaggio 80-909669-801	30.00	77.80	23.34	1	
	- Refreshment cabinet (FWD) Piaggio 80-909745-801	24.00	91.20	21.80	1	
	- Refreshment cabinet (BWD) Piaggio 80-909745-806	26.00	103.20	26.80	1	
	- Carpet Assembly (2) Piaggio Dwg. 80-909544	55.00	134.00	73.70	1	
	TOTAL OPTION # 11	377.00	136.30	513.80		
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N. Belt weight included in seat weight. (2) Including cockpit and rear baggage compartment carpets.					

ATA No.	ITEM DESCRIPTION AND PART NUMBER		WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.) *OPTION # 16 CABIN CONFIGURATION*						
	- Fwd facing seat (RH) ERDA 303558-12	(1)	29.00	117.84	34.17	1	
	- Fwd facing seat (LH) ERDA 303558-11	(1)	29.00	117.84	34.17	1	
	- Fwd facing seat (RH) ERDA 303558-14	(1)	29.00	151.84	44.03	1	
	- Fwd facing seat (LH) ERDA 303558-13	(1)	29.00	151.84	44.03	1	
	- Fwd facing seat (RH) ERDA 303558-16	(1)	29.00	184.84	53.60	1	
	- Fwd facing seat (LH) ERDA 303558-15	(1)	29.00	184.84	53.60	1	
	- Carpet Assembly Piaggio Dwg. 80-909544	(2)	55.00	134.00	73.70	1	
	TOTAL OPTION # 16		229.00	147.29	337.30		
	(1) (AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N. Belt weight included in seat weight. (2) Including cockpit and rear baggage compartment carpets.						

ATA No.	ITEM DESCRIPTION AND PART NUMBER		WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)						
	OPTION # 19 CABIN CONFIGURATION						
	- Two place divan (low back) ERDA 160057-6	(2)	46.00	88.15	40.55	1	
	or						
	- Two place divan (high back) ERDA 160057-8 or 160057-15	(3)	50.00	88.15	44.08	1	
	or						
	- Two place divan (high back) ERDA 160079-2	(3)	48.00	88.15	42.31	1	
	or						
	- Two place divan (high back) GEVEN AV10-3520-00	(3)	48.00	88.15	42.31	1	
	- Fwd facing seat (LH)						
	ERDA 303267-43	(1)	42.00	107.13	44.99	1	
	GEVEN AV08-1101-00	(2)	58.42	107.13	62.58	1	
	- Aft facing seat (LH)						
	ERDA 303267-1	(1)	42.00	136.80	57.46	1	
	GEVEN AV09-1114-00	(4)	61.73	136.80	84.45	1	
	- Aft facing seat (RH)						
	ERDA 303267-2	(1)	42.00	136.80	57.46	1	
	GEVEN AV09-2114-00	(4)	61.73	136.80	84.45	1	
	- Fwd facing seat (LH)						
	ERDA 303267-3	(1)	42.00	189.20	79.46	1	
	GEVEN AV08-1101-00	(4)	58.42	189.20	110.53	1	
	- Fwd facing seat (RH)(1)						
	ERDA 303267-4	(1)	42.00	189.20	79.46	1	
	GEVEN AV08-2101-00	(4)	58.42	189.20	110.53	1	
	- Refreshment Cabinet (Midship) Piaggio 80-909771-807		14.30	122.16	17.46	1	
	(1) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N.						
	(2) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed on both the seats as separate P/N.						
	(3) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 or Model 55 installed on the forward seat and Shoulder Harness Double Strap Model 55 installed on the rear seat as separate P/N.						
	(4) Seat Belts weight included.						

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-50	CARGO/BAGGAGE COMPARTMENT					
	- Restrain Net Keeker Aircraft International KAI-P180-SO-608-1	8.43	298.00	25.12	1	
	- Strap Fitting 40340-1	0.11 (ea.)	298.00	0.33	4	
25-60	EMERGENCY					
	- First Aid Kit Sincromed 180-RAI/2	2.00	228.35	4.57	1	
	or					
	- First Aid Kit Scott 70002-00	3.70	228.30	8.45	1	
	- ELT System Type DMELT8 Dorne Margolin DMELT8	3.00	412.00	12.36	1	
	ELT(AF) System *TECHTEST 503*					
	- Transmitter Techtest 503-1	2.10	412.00	8.65	1	
	- G-Switch Techtest 503-7	0.75	412.00	3.09	1	
	- Mounting Tray Techtest A0637-5	0.40	412.00	1.65	1	
	- Control Panel Techtest 503-4	0.15	16.70	0.02	1	
	- Antenna HR Smith 10-102-26	0.30	412.00	1.24	1	
	UNDERWATER ACOUSTIC BEACON					
	- Underwater Acoustic Beacon Dukane DK100	0.42	342.56	1.44	1	
	- Mount, Beacon Dukane N30A26B	0.37	342.56	1.28	1	

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ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
26	**FIRE PROTECTION**					
26-10	DETECTION					
	- Engine Fire Detector Systron Donner Safety System Div. 3001-147-545/250C-5.3M	0.43 (ea.)	295.00	1.27	2	
26-20	EXTINGUISHING					
	- Engine Fire Extinguisher (Optional) HTL 30104100	8.00 (ea.)	282.70	22.62	2	
	- Portable Cabin Fire Extinguisher (Optional) GH 2-1/2 J	4.80	58.60	2.81	1	
	or					
	- Amerex Corporation Model 352	4.80	58.60	2.81	1	

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ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
27	**FLIGHT CONTROLS**					
27-10	AILERON & TAB					
	- Aileron Trim Tab Actuator Ratier Figeac FE 187-001 or Precilec 702543-01	1.97	253.00	4.98	1	
27-20	RUDDER & TAB					
	- Rudder Trim Tab Actuator Ratier Figeac FE 182-000 or Precilec 702542-01	2.98	410.70	12.24	1	
27-30	ELEVATOR & TAB					
	- Stall Warning Computer Teledyne SLZ7778	2.35	2.30	0.05	1	
	- Angle of Attack Transmitter Teledyne SLZ7306	1.98	134.80	2.67	1	
	- Angle of Attack Indicator (Optional) Teledyne SLZ7651	0.88	19.70	0.17	1	
27-40	HORIZONTAL STABILIZER					
	- Horizontal Tail Trim Actuator Vickers Electro-Mech Inc. EM 4011-1 or Vickers Electro-Mech Inc. EM 4011-2	14.10	411.30	58.00	1	
	- Triple Trim Indicator Farem 05DB11TYP1028 or Farem 05DB11ATYP1172	1.54	39.4	0.60	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
27-50	FLAPS					
	- Fwd. Flap Actuator, LH Microtecnica C132275-5	4.90	– 33.00	– 1.62	1	
	- Fwd. Flap Actuator, RH Microtecnica C132275-6	4.90	– 33.00	– 1.62	1	
	- Outboard Flap Screwjack Microtecnica C132277-3 or Microtecnica C154183-1	2.31 (ea.)	259.90	6.00	2	
	- Outboard Flap Screwjack Microtecnica C132277-4 or Microtecnica C154184-1	2.14 (ea.)	257.90	5.52	2	
	- Drive Unit Microtecnica C152550-1 or Microtecnica C136066-45 or Microtecnica C136066-4 or Microtecnica C136066-3 or Microtecnica C136066-2 with	7.63	270.30	20.62	1	
	- Control Unit Microtecnica C136407-2	4.13	268.10	11.07	1	
	or					
	- Drive Unit Microtecnica C155720-2 with	7.63	270.30	20.62	1	
	- Control Unit Microtecnica C136407-3	4.13	268.10	11.07	1	
	- Inboard Flap Screwjack Microtecnica C136408-2	1.61 (ea.)	272.80	4.39	2	
	- Flap Position Indicator Farem 05DB30TYP1430 or Farem 05DB30ATYP1773	0.25	19.70	0.05	1	
	- Flap Control Lever West Coast Spec. 90-38501 or Sirio Panel 727-0443/01	0.50	28.00	0.16	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
28	**FUEL**					
28-20	DISTRIBUTION					
	- Booster Pump, Main Lear Siegler Inc. Romec Division RR-54520-C or RR-54520-D	2.50 (ea.)	251.20	6.28	2	
	or Parker Hannifin Corp. Airborne Div. 1C12-43	4.00 (ea.)	251.20	10.05	2	
	- Booster Pump, Standby Lear Siegler Inc. Romec Division RR-54520-C or RR-54520-D	2.50 (ea.)	251.20	6.28	2	
	or Parker Hannifin Corp. Airborne Div. 1C12-43	4.00 (ea.)	251.20	10.05	2	
	- Shut-off Valve Vickers Electro-Mech Inc. EM 484-3	1.61 (ea.)	233.10	3.75	2	
	- Crossfeed Valve Vickers Electro-Mech Inc. EM 484-3	1.61	233.10	3.75	1	
	- Filter Aircraft Porous Media Europe Ltd. QAO 5481 or Purolator 1743640-06	1.68 (ea.)	243.30	4.09	2	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
28-40	INDICATING					
	- Probe, Sump Farem 04TL13ATYP1450 or Farem 04TL41TYP1771	0.54 (ea.)	243.60	1.32	2	
	- Probe, Fuselage Tank Farem 04TL12TYP1034 or Farem 04TL40TYP1770	0.48 (ea.)	243.30	1.36	2	
	- Probe, Wing Tank Farem 04TL10TYP1032 or Farem 04TL38TYP1766	0.23	247.60	0.82	1	
	- Probe, Wing Tank Farem 04TL10TYP1108 or Farem 04TL38ATYP1767	0.23	247.60	0.82	1	
	- Probe, Wing Tank Farem 04TL09TYP1031 or Farem 04TL37TYP1764	0.24	250.40	1.10	1	
	- Probe, Wing Tank Farem 04TL09TYP1107 or Farem 04TL37ATYP1765	0.24	250.40	1.10	1	
	- Quantity Indicator Farem 04DB31TYP1400 or Farem 04DB31CTYP1759	0.66 (ea.)	21.20	0.14	2	
	- Probe Wing Tank Farem 04TL11ATYP1401 or Farem 04TL39TYP1768	0.24	245.70	0.59	1	
	- Probe Wing Tank Farem 04TL11ATYP1402 or Farem 04TL39ATYP1769	0.24	245.70	0.59	1	
	- Capacitor (S.N. 1004 to 1035 airplanes) Farem 02XL05TYP1485	0.04	243.50	0.09	2	
	- Probe Wing Tank (S.N. 1016 to 1035 with SB-80-0123 embodied and S.N. 1036 and up airplanes) Farem 04TL21TYP1403 or Farem 04TL42TYP1763	0.22 (ea.)	243.50	0.54	2	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
29	**HYDRAULIC POWER**					
29-10	MAIN					
	- Hydraulic Pack Vickers 520814	20.06	257.70	51.69	1	
29-20	AUXILIARY					
	- Hand Pump OEM 469100-0-1	1.83	38.30	0.70	1	
	- Emergency Bypass Valve Magnaghi Oleodinamica 100-5393-00	0.75	29.60	0.22	1	
29-30	INDICATING					
	- Pressure Indicator Hickok 720-299	0.25	19.70	0.05	1	

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ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
30	**ICE AND RAIN PROTECTION**					
30-10	AIRFOIL					
	WING					
	- Temperature Controller Magnaghi Milano S.p.A. 100-40001-00	2.20 (ea.)	269.20	5.92	2	
	- Shut-off Valve Barber Colman Co. BYLB 51824	1.38 (ea.)	257.38	3.55	2	
30-20	AIR INTAKES					
	- Ice Detector Rosemount 871FA311	1.31	– 12.20	– 0.15	1	
	- Pneumatic Deicer Control Box Magnaghi Milano S.p.A. 100-40002-00	0.66	15.37	0.10	1	
	- Linear Actuator Vickers Electro-Mech Inc. EM4032-2	– 1.80 (ea.)	233.95	4.21	2	
	- Regulator Relief Valve BF Goodrich 3D2372-021	0.90 (ea.)	253.54	2.28	2	
	- Ejector BF Goodrich 3D2381-06	1.10 (ea.)	251.67	2.76	2	
	- Pneumatic Deicer Assy. BF Goodrich 5D7010-01 or Piaggio 80-336235-401	3.5 (ea.)	186.74	6.53	2	

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ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
31	**INDICATING/RECORDING SYSTEMS**					
31-20	INDEPENDENT INSTRUMENTS					
	- Digital Clock Davtron M877	0.31	17.50	0.05	1	
	- Second Digital Clock (Optional) Davtron M877	0.31	17.50	0.05	1	
31-50	CENTRAL WARNING SYSTEMS					
	- Annunciator Panel West Coast Specialties 90-38701 or Sirio Panel 727-0441/01	4.70	17.50	0.82	1	
	- System Test Selector Janco 53-1995	0.15	19.00	0.03	1	
	- Master Annunciator West Coast Specialties 90-38401 or Sirio Panel 727-0440/01	0.22	17.60	0.03	1	
	- Aural Warning Tone Generator Pacific Systems 309-1-2 or Sirio Panel 727-0444/01	0.58	13.60	0.08	1	
31-60	CENTRAL DISPLAY SYSTEMS					
	- Multifunction Display Indicator Pacific Systems 310-1-2 or Sirio Panel 727-0442/01	1.00	19.00	0.19	1	
	- Ground Test/Refuel Panel West Coast Spec. 90-38601 or Sirio Panel 727-0439/01	0.64	268.00	1.71	1	
	- Ground Test/Refuel Panel Sirio Panel 727-0439/02	0.64	268.00	1.71	1	

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ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
32	**LANDING GEAR**					
32-10	MAIN GEAR AND DOORS					
	- Main Gear Unit, LH Dowty Rotol Ltd. 201416003 or retrofit Dowty Rotol Ltd. 201459001	68.00	250.00	170.00	1	
	- Main Gear Unit, RH Dowty Rotol Ltd. 201416004 or retrofit Dowty Rotol Ltd. 201459002	68.00	250.00	170.00	1	
	- Drag Strut, LH Dowty Rotol Ltd. 201418001 or 201418003 or retrofit Dowty Rotol Ltd. 201460001	12.44	250.00	31.10	1	
	- Drag Strut, RH Dowty Rotol Ltd. 201418002 or 201418004 or retrofit Dowty Rotol Ltd. 201460002	12.44	250.00	31.10	1	
32-20	NOSE GEAR AND DOORS					
	- Nose Gear Unit Dowty Rotol Ltd. 201033002	43.00	– 2.00	– 0.86	1	
	- Drag Strut Dowty Rotol Ltd. 201050001 or Dowty Rotol Ltd. 201050002	3.91	– 3.00	– 0.12	1	
32-30	EXTENSION AND RETRACTION					
	- Main L/G Actuator, LH Dowty Rotol Ltd. 114346001 or Dowty Rotol Ltd. 114346003	14.60	249.20	34.38	1	
	- Main L/G Actuator, RH Dowty Rotol Ltd. 114346002 or Dowty Rotol Ltd. 114346004	14.60	249.20	36.38	1	
	- Nose L/G Actuator Dowty Rotol Ltd. 114067003 or Dowty Rotol Ltd. 114067004	9.94	– 2.00	– 0.20	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
32-40	WHEELS AND BRAKES					
	WHEELS					
	- Nose L/G Wheel BF Goodrich 3-1460	2.94 (ea.)	– 19.70	– 0.58	2	
	- Nose L/G Wheel Tire BF Goodrich 5.00-5-8PR-TL 021-310	6.50 (ea.)	– 19.70	– 1.28	2	
	- Main L/G Wheel BF Goodrich 3-1461-1	13.82 (ea.)	279.50	38.63	2	
	- Main L/G Wheel Tire BF Goodrich 6.50-10-12-TL 028-357	18.35 (ea.)	279.50	51.30	2	
	BRAKES					
	- Brake Assy BF Goodrich 2-1504-1 or BF Goodrich 2-1504-4	15.56 (ea.)	279.50	43.50	2	
	- Brake Safety Valve Magnaghi Oleodinamica 100-7398-01	0.13 (ea.)	258.60	0.34	2	
	- Normal/Emergency Brake Valve Magnaghi Oleodinamica 200-25117-00 or Magnaghi Oleodinamica 201-25117-00	2.38 (ea.)	15.80	0.38	2	
	- Parking Brake Valve Magnaghi Oleodinamica 200-25095-00 or Magnaghi Oleodinamica 200-25095-02	0.44	45.70	0.20	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
32-50	STEERING					
	- Steering Potentiometer Dowty Rotol Ltd. 100006149	1.23	21.20	0.26	1	
32-60	POSITION AND WARNING					
	- L/G Unsafe Position Indicator Eaton Inc. 4306-1	0.10	20.50	0.02	1	
	- L/G Locked Down Position Indicator Eaton Inc. 4306-2	0.10	20.50	0.02	1	

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ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
33	**LIGHTS**					
33-10	FLIGHT COMPARTMENT					
	- Light Dimmer KGS Electronics LT-55A	1.22 (ea.)	9.10	0.11	2	
33-40	EXTERIOR					
	- Power Supply Grimes 60-2799-1	2.06	417.00	8.59	1	
	- Strobe Light, Top Grimes 30-1944-1	0.60	417.00	2.50	1	
	- Power Supply Grimes 60-2799-1	2.06	263.20	5.42	1	
	- Strobe Light, Bottom Grimes 30-1944-1	0.60	271.60	1.63	1	
	- Beacon Light Grimes SK30-1877-1	0.26	268.50	0.70	1	
	- Flasher Unit Grimes 70-0196-1	0.43	266.10	1.14	1	
	- Position Light, LH Grimes A-1815A-7A41	0.24	235.40	0.57	1	
	- Position Light, RH Grimes A-1815A-8A41	0.24	235.40	0.57	1	
	- Position Light, Rear Grimes A-2064-14-1683	0.37 (ea.)	244.90	0.91	2	
	- Landing Light MS25241-4581	0.77 (ea.)	– 35.20	– 0.27	2	
	- Taxi Light Grimes 4587	0.47	– 35.20	– 0.17	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
33-40	EXTERIOR (cont.)					
	- Recognition Light Grimes 30-1290-5	0.26	399.00	1.04	1	
	- Wing Inspection Light MS25338-7079	0.03	208.00	0.06	1	
	- Lamp Holder Grimes 60-0026-1	0.06	208.00	0.12	1	
33-60	EMERGENCY LIGHTING					
	- Portable Flash Light	0.88	64.50	0.57	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-10	FLIGHT ENVIRONMENT DATA					
	- Pitot Probe,LH Rosemount Inc. 851GN-1	0.90	– 31.70	– 0.28	1	
	- Pitot Probe,RH Rosemount Inc. 851GN-2	0.90	– 31.70	– 0.28	1	
	- Static Port Aero Instrument Co. ST340-2GP	0.38 (ea.)	109.10	0.41	2	
	- Rate of Climb Indicator Teledyne Avionics SLZ9157-3 or Thommen 4A16.42.60F.05.1.CB	1.95	16.00	0.31	1	
	- Altimeter, copilot Kollsmann/IDC 23932-011 or Thommen 3AG3.42.50F.1.MT	1.89	15.10	0.29	1	
	- Mach/Airspeed Indicator, Copilot Kollsman/IDC 24030-C2125 or Thommen 5C15.42.35K.05.1.BA	2.00	17.50	0.35	1	
	- Air Data Computer, ADC 85 Collins 622-8051-002 with	5.78	– 16.10	– 0.93	1	
	- Air Data Module, ADM 85 Collins 622-8692-003 or	0.05	– 16.10	– 0.01	1	
	- Air Data Computer, ADC 85-A (1) Collins 822-0370-460	5.98	– 16.10	– 0.96	1	
	- Altitude Preselector/Alerter PRE-80A Collins 622-2923-035 or PRE-80C Collins 622-9462-035	1.32	17.50	0.23	1	
	- Altimeter, ALI 80A Collins 622-3975-001 or Collins 622-3975-011	2.84	18.60	0.53	1	
	(1) Including Air Data Module.					

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34-10	FLIGHT ENVIRONMENT DATA (cont.)					
	- Mach Airspeed Indicator MSI-80F Collins 622-6785-131	3.02	18.60	0.56	1	
	- Vertical Speed Indicator VSI-80A Collins 622-4782-001	2.52	18.60	0.47	1	
	- Temperature Sensor Rosemount 129H	0.33	– 12.20	– 0.04	1	
	- Radio Altimeter ALT 55B Collins 622-2855-001 or Collins 622-2855-011	5.60	– 16.10	– 0.90	1	
	- Radio Altimeter Indicator DRI 55 Collins 622-4160-011 or Collins 622-4160-015	0.75	– 14.00	– 0.10	1	
	- Radio Altimeter Antenna ANT-52 Collins 622-6793-001	0.21	110.90	0.23	1	
	- Mounting UMT-12 Collins 622-5212-001	0.44	– 16.10	– 0.07	1	
	- Encoding Altimeter, copilot (Optional) United Instruments 5506-SG5-Y	3.31	16.00	0.53	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34-20	ATTITUDE AND DIRECTION					
	- Turn and Slip Indicator RC Allen RCA59-01	1.20	18.60	0.22	1	
	or					
	- Turn and Slip Indicator United Instruments 9551B	1.30	18.60	0.24	1	
	- Magnetic Compass Airpath Instr. Comp. C2350-L4-M23	0.64	7.60	0.05	1	
	- Radio Magnetic Indicator Aeronetics 3337LB21C	2.61 (ea.)	16.00	0.42	2	
	or Collins 622-2506-006					
	- Electronic Flight Display EFD-74 Collins 622-6197-002	4.87	16.00	0.78	1	
	- Attitude Director Indicator ADI-84A Collins 622-3594-017	4.76	16.00	0.76	1	
	- Attitude Director Indicator ADI-84 Collins 787-6173-217	4.76	16.00	0.76	1	
	- Directional Gyro DGS-65 Collins 622-6136-002	5.75 (ea.)	– 5.50	– 0.32	2	
	- Flux Detector Unit FDU-70 Collins 622-5812-001	0.90 (ea.)	379.00	3.41	2	
	- Remote Compensator Panel RCP-65 Collins 622-6174-001	0.40 (ea.)	– 15.50	– 0.06	2	
	- Standby Gyro Horizon AIM 504-0035-914	1.50	18.60	0.28	1	
	- Emergency Power Unit 28-24 RM(2) Castleberry 0900-1840-22	7.50	13.60	1.02	1	
	or					
	- Emergency Power Unit 28-24 RMT (2) Castleberry 0900-1840-22T	7.50	13.60	1.02	1	
	- Display Proc. DPU-85N (1) Collins 622-8678-014	13.70	– 16.50	2.26	1	
	with					
	- Processor Unit MPU-85N (1) Collins 622-8679-014	17.47	– 16.50	2.88	1	
	(1) Only for Standard Avionics without FMS or Standard Avionics with UNS-1D or UNS-1K.					
	(2) With Mounting Rack P/N 1900-1603-02.					

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34-20	ATTITUDE AND DIRECTION (cont.)					
	- Vertical Gyro VG206D JET 501-1204-01	4.63 (ea.)	– 14.20	– 0.66	2	
	- Display Control Panel, HCP-74 Collins 622-6200-003	0.59	37.70	0.22	1	
	- Display Processor Unit HPU-74 Collins 622-6198-001	4.59	– 16.50	– 0.76	1	
	- Display Processor Unit HPU-74A Collins 622-6199-001	4.59	– 16.50	– 0.76	1	
	- Fan Monitor Module, FMM 85 Collins 622-7154-002	0.21 (ea.)	– 23.50	– 0.05	3	
	- Blower Collins 009-1965-030	1.30 (ea.)	7.50	0.10	2	
	- Fan Monitor Module, FMM 85 Collins 622-7154-001	0.21 (ea.)	12.70	0.03	2	
	- Inclinometer Collins 634-4320-002	0.07	16.50	0.01	1	
	- EFD-85B Display Collins 622-6020-022	7.05 (ea.)	16.75	1.18	2	
	- Display Proc. DPU-85N Collins 622-8678-002 with	13.70	– 16.50	2.26	1	
	- Processor Unit MPU-85N Collins 622-8679-002	17.47	– 16.50	2.88	1	
	- Mount UMT-14B Collins 622-7265-001	2.10	– 16.50	– 0.35	1	
	- Display Selector Panel DSP-85B Collins 622-9116-014	2.70	35.00	0.95	1	
	- Display MFD 85B Collins 622-7876-012	9.64	16.75	1.61	1	
	- Mount UMT-15B Collins 622-7266-001	2.60	– 16.50	0.43	1	
	- Long. Accelerometer LAC 80 Collins 229-0324-020	0.16	– 16.50	0.08	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34-40	INDEPENDENT POSITION DETERMINING					
	WEATHER RADAR COLLINS WXR-840					
	- Transceiver/Antenna RTA 842 Collins 622-9301-001 or 622-9301-011	18.39	– 44.00	– 8.09	1	
	with					
	- Control Panel WXP-840A Collins 622-9304-004	2.00	17.50	0.35	1	
	or					
	- Transceiver/Antenna RTA 842 Collins 622-9301-003 or 622-9301-004	18.39	– 44.00	– 8.09	1	
	with					
	- Control Panel WXP-840A Collins 622-9304-014	2.00	17.50	0.35	1	
	TURBULENCE WEATHER RADAR (Optional) COLLINS TWR-850					
	- Transceiver/Antenna RTA 852 Collins 622-8439-001 or 622-8439-011	18.39	– 44.00	– 8.09	1	
	with					
	- Control Panel WXP-850A Collins 622-8393-004	2.00	17.50	0.35	1	
	or					
	- Transceiver/Antenna RTA 852 Collins 622-8439-003 or 622-8439-004	18.39	– 44.00	– 8.09	1	
	with					
	- Control Panel WXP-850A Collins 622-8393-014	2.00	17.50	0.35	1	

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ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34-50	DEPENDENT POSITION DETERMINING					
	ATC TRANSPONDER (Dual Installation)					
	- Transponder TDR-90 Collins 622-1270-001	3.48 (ea.)	– 16.50	– 0.57	2	
	- Control Adapter CAD62 Collins 622-6590-001 or Collins 622-6590-002	0.44	– 12.60	– 0.06	1	
	- Control Unit CTL 92 Collins 622-6523-005 or Collins 622-6523-205	1.25	16.70	0.21	1	
	- Antenna Dorne-Margolin DM NI70-2	0.25	22.90	0.06	1	
	- Antenna Dorne-Margolin DM NI70-2	0.25	48.70	0.12	1	
	ATC TRANSPONDER (Single Installation)					
	- Transponder TDR-90 Collins 622-1270-001	3.48	217.50	7.57	1	
	- Control Adapter CAD62 Collins 622-6590-001 or Collins 622-6590-002	0.44	217.50	0.96	1	
	- Control Unit CTL 92 Collins 622-6523-005 or Collins 622-6523-205	1.25	16.70	0.21	1	
	- Antenna Dorne-Margolin DM NI70-2	0.25	22.90	0.06	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34-50	DEPENDENT POSITION DETERMINING (cont.)					
	ATC/Mode S - ATC TRANSPONDER (Dual Installation with Mode S)					
	- Primary Transponder TDR-94 ATC/Mode S Unit Collins 622-9352-005	9.60	– 30.90	– 2.97	1	
	- Secondary Transponder TDR-90 ATC Unit Collins 622-1270-001	3.48	– 16.50	– 0.57	1	
	- Control Adapter CAD62 Collins 622-6590-001 or Collins 622-6590-002	0.44	217.50	0.96	1	
	- Control Unit CTL 92 Collins 622-6523-005 or Collins 622-6523-205	1.25	16.70	0.21	1	
	- Antenna Dorne-Margolin DM NI70-2	0.25	22.90	0.06	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34-50	DEPENDENT POSITION DETERMINING (cont.)					
	DME					
	- Transceiver DME-42 Collins 622-6263-003	5.07	– 38.60	– 1.96	1	
	- Antenna Dorne-Margolin DM NI70-2	0.25	47.70	0.12	1	

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ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34-50	DEPENDENT POSITION DETERMINING (cont.)					
	SINGLE ADF					
	- Receiver ADF-462 Collins 622-7382-101	4.20	– 16.10	– 0.67	1	
	- Control Unit CTL 62 Collins 622-6522-005	1.26	16.70	0.21	1	
	- Antenna ANT-462A Collins 622-7383-001	3.40	205.20	6.98	1	
	DUAL ADF (Optional)					
	- Receiver ADF-462 Collins 622-7382-101	4.20 (ea.)	– 16.10	– 0.67	2	
	- Control Unit CTL 62 Collins 622-6522-013	1.26	16.70	0.21	1	
	- Antenna ANT-462B Collins 622-7384-001	3.40	205.20	6.98	1	

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ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34-50	DEPENDENT POSITION DETERMINING (cont.)					
	VHF NAVIGATION 1					
	- Receiver VIR-32 Collins 622-6137-001 or Collins 622-6137-201	4.57	– 16.50	– 0.75	1	
	- Mounting UMT-12 Collins 622-5212-001	0.44	– 16.50	– 0.07	1	
	- Control Unit CTL 32 Collins 622-6521-013	1.27	16.70	0.21	1	
	- Antenna, Marker Beacon Dorne-Margolin DM N27-3	0.53	77.00	0.41	1	
	- Antenna, Glideslope Dayton Granger RGS10-48	0.13	– 44.10	– 0.06	1	
	- Diplexer, Glideslope Dorne-Margolin DMH24-1	0.21	– 11.50	– 0.03	1	
	- Diplexer, Marker Beacon (Optional) Comant Industries CI509	0.20	– 14.37	– 0.03	1	
	- Diplexer, VOR/LOC Dorne-Margolin DMH21-1	0.19	– 14.50	– 0.03	1	
	- Antenna, VOR/LOC Dorne-Margolin DMN4-17	1.00	417.30	4.17	1	
	VHF NAVIGATION 2					
	- Receiver VIR-32 Collins 622-6137-001 or Collins 622-6137-201	4.57	– 16.50	– 0.75	1	
	- Mounting UMT-12 Collins 622-5212-001	0.44	– 16.50	– 0.07	1	
	- Control Unit CTL 32 Collins 622-6521-013	1.27	16.70	0.21	1	

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ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
35	**OXYGEN**					
35-10	CREW					
	- Oxygen Mask, Crew Scott Aviation Co. MC 10-15-13	1.07 (ea.)	47.00	0.50	2	
	- Oxygen Cylinder Scott Aviation Co. 89511040	11.79	125.10	14.75	1	
35-20	PASSENGER					
	- Oxygen Mask, Autodeployement Scott Aviation Co. 833-730	1.00	110.50	1.10	1	
	- Oxygen Mask, Autodeployement Scott Aviation Co. 833-730	1.00	102.30	1.02	1	
	- Oxygen Mask, Autodeployement Scott Aviation Co. 833-730	1.00 (ea.)	175.30	1.75	2	
	- Oxygen Mask, Autodeployement Scott Aviation Co. 833-730	1.00	215.80	2.16	1	

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ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
38	**WATER/WASTE**					
38-30	WASTE DISPOSAL					
	- Toilet Assembly with belts (Optional) Piaggio 80-909619	37.50	218.18	81.82	1	
	- Toilet Assembly Piaggio 80-909620	25.00	218.18	54.55	1	
	- Toilet Assembly with seat and belt Piaggio 80-909674-401	37.00	80.89	29.93	1	
56	**WINDOWS**					
56-10	FLIGHT COMPARTMENT					
	- Windshield, 3 plies, LH PPG NP165231-01	66.14	23.47	15.52	1	
	- Windshield, 3 plies, RH PPG NP165231-02	66.14	23.47	15.52	1	
	- Windshield, 2 plies, LH PPG NP165251-01	46.30	23.47	10.87	1	
	- Windshield, 2 plies, RH PPG NP165251-02	46.30	23.47	10.87	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
61	**PROPELLERS**					
61-10	PROPELLER ASSEMBLY					
	- Propeller (CCW) RH Hartzell HC-E5N-3L/LE8218 or Hartzell HC-E5N-3AL/LE8218	176.09	329.80	580.74	1	
	- Propeller, (CW) LH Hartzell HC-E5N-3/HE8218 or Hartzell HC-E5N-3A/HE8218	176.09	329.80	580.74	1	
	- Spinner (RH) Hartzell D5527LP or Hartzell D5527-1LP	11.30	337.40	38.13	1	
	- Spinner (LH) Hartzell D5527P or Hartzell D5527-1P	11.30	337.40	38.13	1	
61-20	CONTROLLING					
	- Overspeed Governor Woodward Governor Co. 210962	3.62 (ea.)	321.80	11.65	2	
61-40	INDICATING					
	- Indicator, Propeller RPM Farem 15DM12TYP1418 or Farem 15DM14TYP1743	1.21 (ea.)	17.00	0.21	2	
	- Transducer, Propeller RPM Electro Mech EM 8028-1 or Electro Mech EM 8028-1A or Farem 15TG02TYP1542	0.70 (ea.)	319.80	2.24	2	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
72	**ENGINE**					
72-00	GENERAL					
	- Engine, LH (CW) PT6A-66 Pratt & Whitney Canada 3037000 BUILD SPEC 677	470.00	293.90	1381.33	1	
	- Engine, RH (CCW) PT6A-66 Pratt & Whitney Canada 3037000 BUILD SPEC 676	456.00	293.10	1336.54	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
73	**ENGINE FUEL AND CONTROL**					
73-30	INDICATING					
	- Flow Transmitter Foxboro Co. 1/2-1-81-302	0.57 (ea.)	263.80	1.50	2	
	- Flow Rate Indicator Farem 16DM05TYP1432 or Farem 16DM05TYP1746	1.21 (ea.)	17.00	0.21	2	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
77	**ENGINE INDICATING**					
77-10	POWER					
	- Transducer, Torque Labem DA55-95-7-1	0.68 (ea.)	297.50	2.02	2	
	- Indicator, Torque Farem 13DM08TYP1417 or Farem 13DM09TYP1742	1.21 (ea.)	17.00	0.21	2	
	- Transducer, Turbine RPM Electro Mech EM 8028-1 or Electro Mech EM 8028-1A or Farem 15TG02TYP1542	0.70 (ea.)	265.70	1.86	2	
	- Indicator, Turbine RPM Farem 15DM12ATYP1419 or Farem 15DM14TYP1744	1.21 (ea.)	17.00	0.21	2	
77-20	TEMPERATURE					
	- Indicator, Turbine Temperature Farem 08DM10TYP1420 or Farem 08DM13TYP1745	1.21 (ea.)	17.00	0.21	2	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
79	**OIL**					
79-20	DISTRIBUTION					
	- Oil Cooler Marston Palmer D1688-200A or Sumitomo 50004001-11 or Sumitomo 50004001-41	12.28 (ea.)	267.70	32.87	2	
	- Electro Pneumatic Valve Barber Colman Co. PYLB 51541	0.92 (ea.)	288.10	2.65	2	
79-30	INDICATING					
	- Indicator, Oil Temp. & Press. Farem 14DM02TYP1399 or Farem 14DB25TYP1747	0.88 (ea.)	17.00	0.15	2	
	- Transducer, Pressure Systron Donner 125582-1 or Systron Donner 125582-3 or Patriot SP510-29-150G	0.37 (ea.)	267.70	0.99	2	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
80	**STARTING**					
80-10	CRANKING					
	- Relay Hartman A703T	2.02 (ea.)	270.00	5.45	2	

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SECTION 7

DESCRIPTION AND OPERATION

7.0 AIRFRAME

The P-180 AVANTI is a twin-engine, three-lifting-surfaces (forward wing, main mid-wing, T-tail horizontal stabilizer), pusher propellers, turbine-powered airplane.
The airplane is of mixed aluminum alloy-advanced composite construction. It consists of three major units: the forward fuselage, the aft fuselage with the main wing, and the tail cone with the T-empennage.

The forward and the aft fuselage, mated at the rear pressure bulkhead, are light alloy monocoque structures with riveted stretched skin. The forward fuselage consists of the nose section and the pressurized cabin. The nose section, crossed by the forward wing, houses the avionics compartment and the nose landing gear well. The cabin section is sealed to maintain pressurization and can be arranged with a large variety of optional equipment and furnishings.
A two-piece cabin door is located on the left side of the fuselage just aft of the cockpit. The upper portion is forward side hinged. A latch retains the door when in the open position. The lower portion folds down to provide two steps for easy in-boarding and deplaning passengers. The door locking mechanism consists of seven pins in the upper door and four pins in the lower door, which are actuated by two handles. Observing through inspection windows the correct alignement of suitable indicators, it is possible to ensure if the doors are properly closed and latched. In addition a microswitch for each pin is provided to monitor their correct position: if one or more of the pins are not in the correct position, the red CAB DOOR light on the annunciator panel will flash and if all are released (door open) the light will be steady. The electrical circuit test is automatically activated during the annunciator panel test.
Windows include the windshields, six passenger windows on the left side and seven on the right. On the right side, the first window aft of the windshield is a combination window/emergency exit which opens inward the cabin when released. A red release handle is provided on both the internal and external side of the emergency window. On S.N. 1034 and up airplanes a safety pin with a "REMOVE BEFORE FLIGHT" red warning flag allows locking the internal handle when the airplane is parked.

The forward wing is a single-piece structure fixed mated to the fuselage. The full span flaps are operated through electrical actuators. The forward wing and related flaps are:
– graphite composite construction up to S.N. 1033 airplane,
– light alloy with two spar and riveted skin construction on S.N. 1034 and up airplanes.

The graphite composite and the metal construction forward wing are interchangeable.

The aft fuselage consists of the wing intersection section, just aft of the rear pressure bulkhead, housing the integral fuselage fuel tanks, the fuel collector tanks and the main landing gear wells and of the baggage compartment section housing the environmental control package below the compartment floor. The top-hinged baggage compartment door is on the left side of the fuselage aft of wing trailing edge. The baggage compartment and landing gear doors are composite material.
The light alloy, cantilever, mid wings are torsion box stuctures each made of two machined top and bottom panels with integral stiffeners and two machined spars sealed to contain fuel. A third rear spar runs from the engine nacelle to the fuselage centerline. The two wings are mated at fuselage centerline while the three spars are diffusively connected to three fuselage bulkheads. The leading edges are light alloy stretched skin with bonded ribs.
The trailing edges are composite material.
The ailerons are all-metal mass balanced stuctures.
The main wing flaps are composite construction. The outboard Fowler and the inboard single slotted flaps are electrically controlled by a drive unit through rigid shafts and screwjack actuators. An electronic control unit coordinates motion of the forward and the main wing flaps.

Anti static wicks attached to the trailing edges of wings and tail surfaces are designed to clear the airplane of surface static electricity that might disrupt low frequency reception or cause VHF interference. A total of 16 static wicks are installed: 3 on each wing aileron, 3 on each elevator, 1 on each forward wing flap, 1 on the rudder (lower end) and 1 on the vertical fin tip fairing. The engine nacelles are composite construction. Each nacelle consists of an upper section with the integral engine air intake, a lower section with the air intakes for engine oil and starter-generator cooling, and an aft section. Each section can be removed to gain access to the engine.

The tail cone with the vertical stabilizer are graphite composite construction up to S.N. 1033 airplane and complete light alloy construction on S.N. 1034 and up airplanes. A graphite composite rudder has been installed up to S.N. 1033 airplane while a light alloy rudder with two spars and riveted skin structure has been installed on S.N. 1034 and up airplanes.
The graphite composite and the metal construction rudder are interchangeable.
The movable horizontal stabilizer is graphite composite construction while the elevators are light alloy structures with one spar and riveted skin.

Rudder and elevator are aerodinamically and mass balanced.

7.1 FLIGHT CONTROLS

The conventional primary flight controls are operated by dual control wheels and pedals. The control wheels operate the ailerons and the elevators. The adjustable pedals operate the rudder and the nose steering. The toe brakes, which are an integral part of the pedals, operate the wheel brakes.

The pilot's and copilot's rudder pedals are individually adjustable through the RUDDER PEDAL ADJ control handles on both lower sides of the instrument panel close to the cockpit walls. Pulling out and holding the handle the springloaded pedals adjusting mechanism unlocks allowing to readjust the pedals only by pushing the pedals to the desired position. At this point pushing in the handle the rudder pedal adjusting mechanism locks again.

The control surfaces are mechanically connected to the pilot controls through systems of cables, pulleys, push-pull rods and bellcranks.
An up-down spring mechanism, linked to the stabilizer, is installed in the longitudinal control system to provide a suitable pilot stick force through the complete center of gravity range.

Secondary control is provided by the aileron and rudder trim tabs for roll and yaw, and by the all movable horizontal stabilizer for pitch attitude. All trimming surfaces are electrically operated and controlled.
The roll trim is accomplished by positioning the aileron trim tab on the inboard trailing edge of the right aileron through actuation of the roll trim actuator. The roll trim system operates on the left single feed bus through the 3-amp ROLL TRIM circuit breaker on the pilot's circuit breaker panel.
The aileron trim is controlled through the pilot's and copilot's control wheel trim switches (CWTS). Each control wheel trim switch is a dual-function (trim and trim arming) switch which controls roll trim and primary pitch trim. One switch is located on the outboard horn of each control wheel. Each switch has four positions: LWD, RWD, NOSE UP and NOSE DN. The arming button on top of each switch must be depressed for trim motion to occur. Actuation of either control wheel trim switch to LWD or RWD will signal the aileron trim tab actuator to move the tab as required to lower the appropriate wing. Actuation of the pilot's switch will override actuation of the copilot's switch.'
Aileron trim tab position indication is provided by the ROLL indicator located in the TRIM indicator panel in the center pedestal. Two semi-circular scales and a pointer present the trim tab position in terms of LWD (left wing down) and RWD (right wing down). The scales markings represent increments of trim tab travel. The indicator operates on the right single feed bus through the 3-amp TRIM POSN circuit breaker on the copilot's circuit breaker panel.

The yaw trim is accomplished by positioning the rudder trim tab on the lower trailing edge of the rudder through actuation of the yaw trim actuator. The yaw trim system operates on the 28 VDC left single feed bus through the 3-amp YAW TRIM circuit breaker on the pilot's circuit breaker panel.

The yaw trim is pilot-controlled through the RUDDER TRIM switch located on the pedestal trim control panel. The switch has three positions: NOSE LEFT, OFF and NOSE RIGHT. The switch knob is split and both halves must be rotated simultaneously to initiate yaw trim motion. When the switch is released, both halves return to the center OFF position. Actuation of the rudder trim switch to NOSE LEFT or NOSE RIGHT will signal the yaw trim actuator to move the rudder trim tab in the appropriate direction.
Rudder trim tab position indication is provided by the YAW indicator located in the TRIM indicator panel in the center pedestal. A semi-circular scale and pointer indicates the direction (L or R) of yaw trim. The scale markings represent increments of rudder trim tab travel. The indicator operates on the right single feed bus through the 3-amp TRIM POSTN circuit breaker on the copilot's circuit breaker panel.

Pitch trim is accomplished by repositioning the horizontal stabilizer to the desired trim setting through actuation of the horizontal stabilizer pitch trim actuator. The three-motor, screw-jack type actuator has a primary and a secondary mode of operation.
Primary pitch trim control circuits operate on the left dual feed bus through the 3-amp PRI PITCH TRIM circuit breaker on the pilot's circuit breaker panel. Secondary pitch trim control circuits operate on the essential bus through the 5-amp SEC PITCH TRIM circuit breaker on the pilot's circuit breaker panel.
When in primary mode: one motor drives the low rate pitch trim changes in the range from 2° ND to 2° degrees NU, the second motor drives the high rate pitch trim changes in the range from 2° NU to 8° degrees NU, and the third motor is operated by the autopilot at the low rate speed.
When in secondary mode the autopilot is disengaged and the manual control only is allowed through the low rate motor in the range from 2° ND to 8° degrees NU.
The primary and secondary pitch trim systems are electrically independent and mode selection is made through PITCH TRIM selector switch located on the pedestal trim control panel. The switch has three positions: PRI, OFF, and SEC. When the switch is set to PRI trim changes are accomplished through the control wheel trim switches (CWTS). When the switch is set to SEC trim changes are accomplished through the pedestal NOSE DN-OFF-NOSE UP split switch. When the switch is set to the OFF position, both pitch trim electrical control circuits are isolated from the airplane electrical system. The autopilot is inoperative with the PITCH TRIM selector switch in the OFF position.
Each control wheel trim switch (CWTS), located on the outboard horn of each control wheel, is a dual-function (trim and trim arming) switch which controls primary pitch trim and roll trim. Each switch has four positions: LWD, RWD, NOSE UP and NOSE DN. The arming button on top of each switch must be depressed for trim motion to occur.
Actuation of either control wheel trim switch to NOSE UP or NOSE DN will signal the primary mode motors in the pitch trim actuator to move the stabilizer in the appropriate direction. Actuation of the pilot's switch will override actuation of the copilot's switch.
Actuation of either switch to any of the four positions when the autopilot is engaged (without pushing the arming button) allows to insert autopilot pitch and roll attitude changes.
The NOSE DN-OFF-NOSE UP switch, on the pedestal trim control panel, controls secondary pitch trim. The switch is spring loaded to the center (OFF) position and is split in two parts: only moving both halves together the appropriate movement of the horizontal stabilizer is obtained. With the PITCH TRIM selector in the SEC position, actuation of the switch will drive the third motor of the horizontal stabilizer pitch trim actuator to move the stabilizer in the appropriate direction only at the low rate speed.
When the SEC trim has been selected the autopilot cannot be engaged. With the PITCH TRIM selector in the PRI position, this switch has no effect.
A control wheel Master Switch (MSW) is located beneath the control wheel trim switch on the outboard horn of each control wheel. Each momentary type control wheel Master Switch, when depressed, will inhibit either primary or secondary pitch trim or rudder trim in the event of an actuator runaway. In addition the control wheel Master Switch provides the autopilot disconnection as well as the nose steering release.
A trim-in-motion audio signal system is installed on the primary pitch trim actuator to alert the crew of horizontal stabilizer movement.

Horizontal stabilizer trim position indication is provided by the PITCH indicator located in the trim indicator panel on the pedestal. ND and NU markings indicate the direction of trim travel for airplane nose down and airplane nose up respectively. The indicator operates on the right single feed bus through the 3-amp TRIM POSTN circuit breaker on the copilot's circuit breaker panel. The scale markings represent increments of two degrees of the longitudinal trim travel.

7.2 FLAP SYSTEM

The electrically controlled flap system provides setting of the forward and the main wing flap surfaces. The flap control system consists of four mechanically independent subsystems:

- The Main Wing Outboard Flaps (MWOF)
- The Main Wing Inboard Flaps (MWIF)
- The Forward Wing Left Flap (FWLF)
- The Forward Wing Right Flap (FWRF)

The operation of the four subsystems is coordinated by an Electronic Control Unit which controls the power supply to the d.c. motors of each subsystem actuator.
A Drive Unit, located in the center of the fuselage, embodies the two independent motors and geartrains which actuate the main wing outboard flaps (MWOF) and inboard flaps (MWIF) subsystems.
Each Fowler-type outboard flap runs on two tracks and is actuated by two screwjacks. The screwjacks of the left and right surfaces are mechanically interconnected through rotating shafts linkages engaged on the drive unit.
Each single-slotted inboard flap is actuated by a single screwjack connected to the drive unit through a rotating shaft.
The mechanically independent left flap (FWLF) and right flap (FWRF) of the forward wing are single-slotted type. Each surface is driven by an electromechanical dual linear actuator.
A gated FLAP control lever, located on the control pedestal right side of the condition levers, allows setting the flaps through a flap selector switch. The control lever has three positions: UP (clean setting), MID (takeoff setting) and DN (landing setting). Each setting can be selected moving the control lever to the desired position: from UP to MID, from MID to DN and vice versa (single step command), or directly from UP to DN and vice versa (direct command).

NOTE

The use of single step control is recommended as normal operating procedure.

Stop microswitches control the surfaces stopping in the selected position. In addition mechanical stops are provided in the UP and DN configurations.
Moving the FLAP lever from UP to MID the flap surfaces deployment will be completed in 16 seconds (nominal) as per the following schedule:

- the main wing outboard flaps will start travelling while the inboard flaps and the forward wing flaps will rest in the clean setting;
- after 9 seconds (nominal) of delay the forward wing flaps also will start then stop after 1 second of travel; the inboard flaps remain in clean setting; the main wing outboard flaps motion continues;
- after further 5 seconds (nominal) of delay the inboard flaps also will start; the forward wing flaps will restart; the main wing outboard flaps motion continues;
- after further 2 seconds all the flaps sections will reach the takeoff setting.

When the flap control lever is moved from MID to DN all the flap surfaces simultaneously will start motion and will reach the full extension in 5 seconds (nominal) travel.
The flap retraction requires 5 seconds (nominal) from the landing to the takeoff setting (FLAP lever from DN to MID) and 16 seconds (nominal) from the takeoff to the clean setting (FLAP lever from MID to UP). All flap subsystems start retracting simultaneously.

FLAP SETTING TABLE

FLAP SETTING	FWD WING FLAPS	MAIN WING OUTBOARD FLAPS	MAIN WING INBOARD FLAPS
UP	0°	0°	0°
MID	13°	10°	20°
DN	30°	30°	45°

The FLAPS position indicator, mounted in the center of the lower section of the instrument panel, provides the crew with visual indication of flaps surfaces position. The indicator face consists of two arc scales and pointers in the upper section and two vertical scales and pointers in the lower section. All the scales have markings for UP, MID and DN positions. The arc scales show the position of left and right forward wing flaps. The OUTB vertical scale on the left side shows the position of the main wing outboard flaps. The INB vertical scale on the right side shows the position of the main wing inboard flaps. Each flap subsystem actuating motor drives a potentiometer which provides the position signal to the corresponding indicator scale through the electronic control unit.

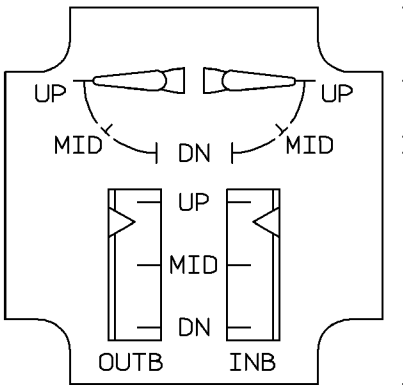

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Figure 7-1. FLAPS POSITION INDICATOR

A FLAP SYNC caution light on the annunciator display will come on in the event of either a system failure is detected or an asymmetric/incorrect flaps deployment occurs.

Airplanes <u>without</u> S.L. 80-0020.

An acoustic warning will be generated whenever the flaps are lowered to the DN position and the landing gear is not locked down. In addition the acoustic warning will be generated whenever the flaps are in the MID position, the landing gear is not locked down and the left power lever is retarded approximately below the half travel position.

* * * * * *

Airplanes incorporating S.L. 80-0020.

An acoustic warning will be generated whenever the flaps are lowered to the MID OR DN position and the landing gear is not locked down. In addition, at the takeoff, the acoustic warning will be generated if the flaps <u>are not</u> retracted to the clean (UP) setting within approximately 25 seconds after the landing gear has been retracted.

* * * * * *

The 326 Hz warning tone cannot be silenced by the mute switch and will continue until either the landing gear is extended or the flaps are retracted to the clean (UP) setting.

The SYS TEST selector switch allows testing the system after being rotated to the FLAPS position. Refer to the Preflight Check procedure in Section 4 of this Handbook for further information about the system test procedure. A MID Interlock Control (MIC) in the electronic control unit checks the main wing outboard flaps and both forward wing flaps subsystems for the transit through the MID setting when the FLAP control lever is moved directly from either UP to DN or DN to UP (direct command). There is no check on the main wing inboard flaps subsystem. The MID Interlock Control inhibits further travel beyond the MID position until all the checked subsystems have reached this configuration.

If an asymmetric flap condition occurs after such direct command, in order to reduce the asymmetry (if necessary) the FLAP control lever can only be moved to the previous (UP or DN) position.

If an asymmetric flap condition occurs after a single step command, the FLAP lever can only be moved to the previous position for recovering the original flaps configuration. The flap system operates on 28 VDC supplied from the left generator bus through a 35-ampere remote control circuit breaker located in the baggage compartment: this breaker can be reset through the 0.5-ampere FLAPS PWR circuit breaker on the copilot circuit breaker panel. As further protection three circuit breakers are provided, all located on the copilot circuit breaker panel: the 3-ampere L FWD WING FLAP and R FWD WING FLAP circuit breakers that protect respectively the left and the right forward wing flap actuators, and the 10-ampere OUTB WING FLAP circuit breaker that protects the main wing outboard flaps actuator.

7.3 CONTROL LOCKS

The control lock consists of a clamp, a pin and a connecting rod joined together with a chain. The pin and the connecting rod lock the primary flight controls while the clamp fits around the engine control levers in order to avoid starting the engines with the flight control locks installed.
It is important that the locks be installed and removed together to preclude the possibility of an attempt to taxi or fly the airplane with the engine control released and the flight controls locked.
Install the control locks in the following sequence:

1. Connect the pilot control column and the pilot rudder pedals by means of the connecting rod: with the pedals aligned at neutral insert the long pin of the rod through the pedals locking holes then insert the short pin of the rod through the control column locking plate.
2. Insert the pin through the hole provided in the rear side of the pilot control wheel when centered.
3. Position the clamp around the engine control levers.

Remove the locks in the following order: first the connecting rod from the control column and the rudder pedals, then the pin from the control wheel and, as last step, the clamp from the engine control levers.

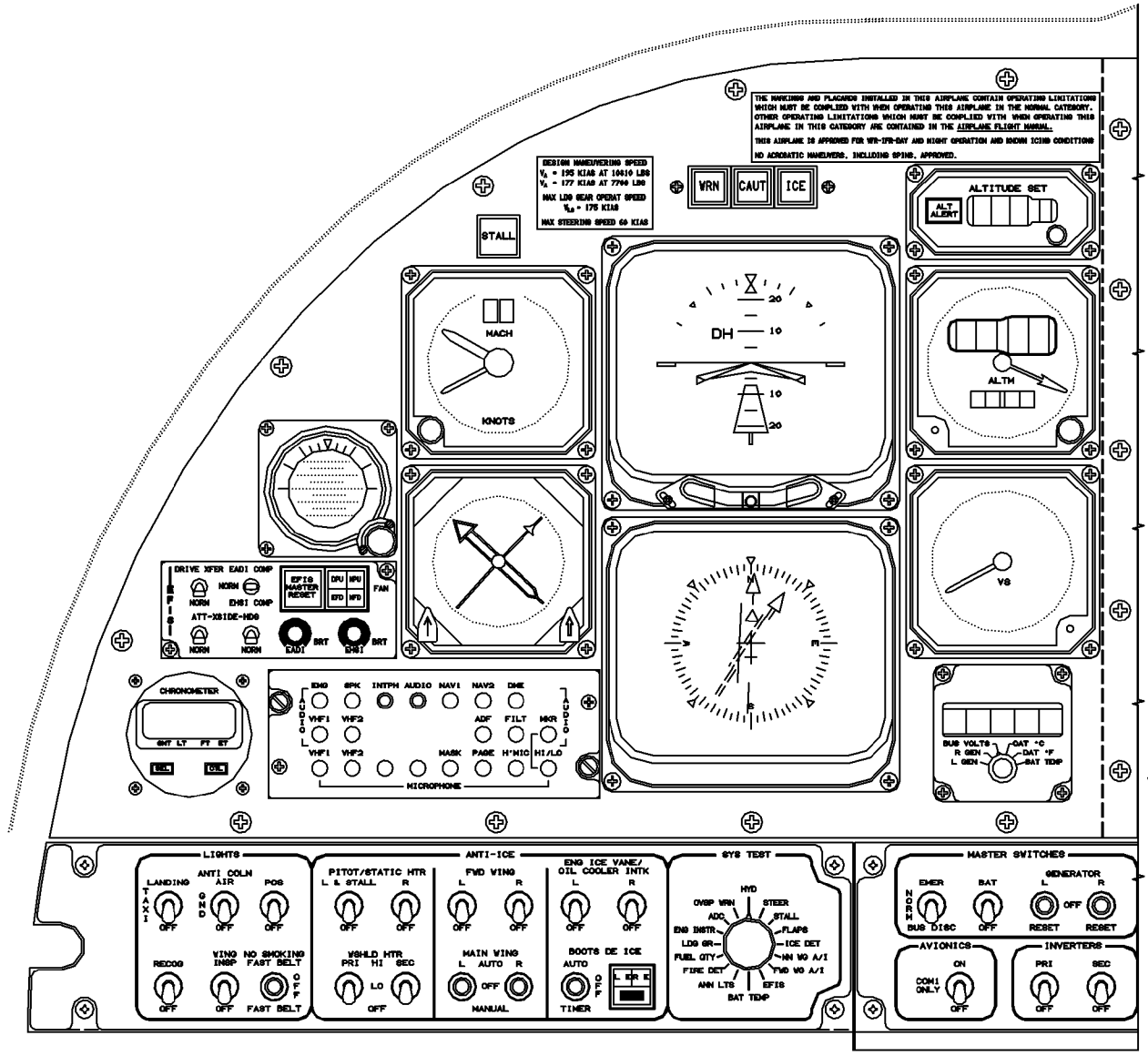

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Figure 7-2. TYPICAL INSTRUMENT PANEL - LEFT SECTION

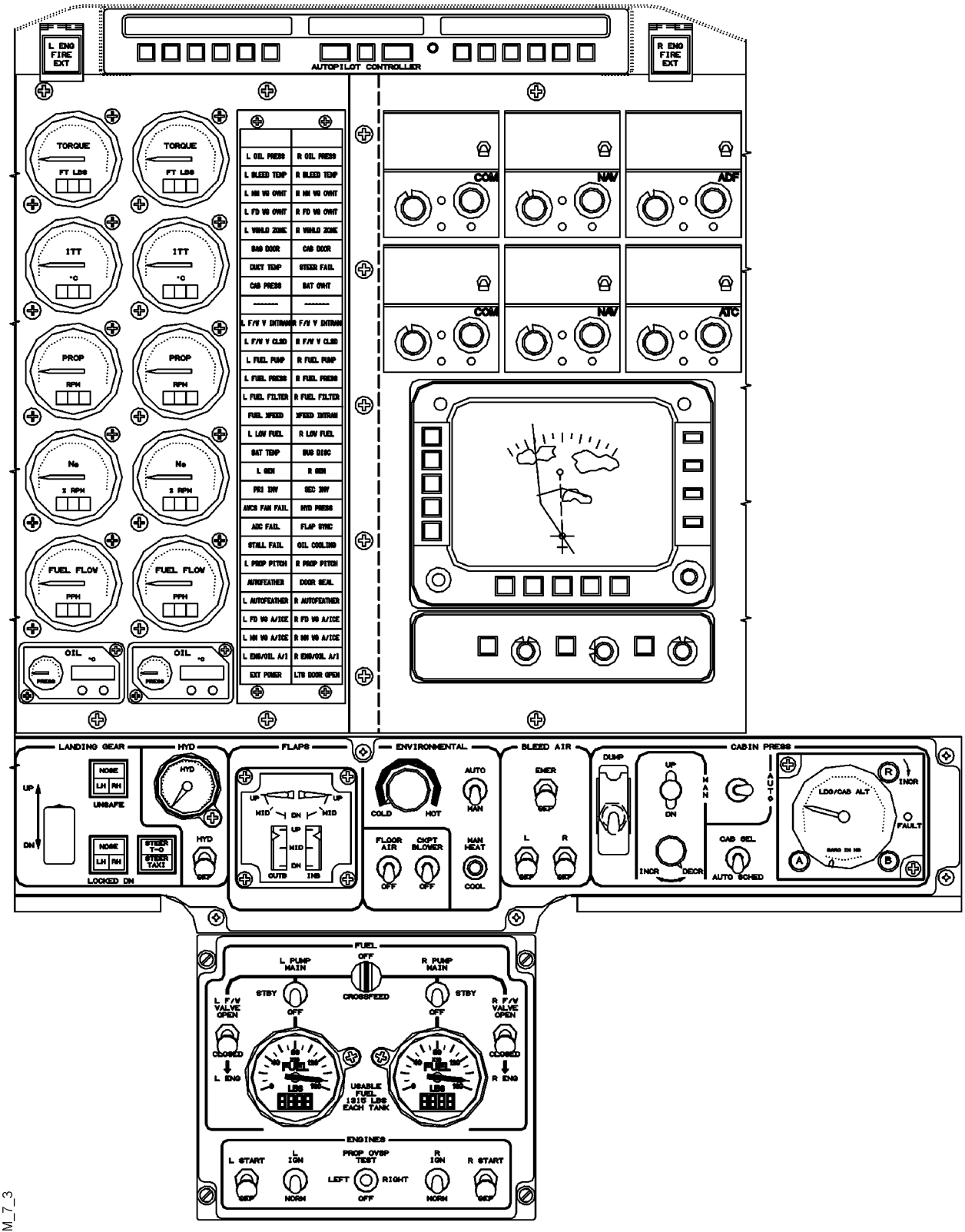

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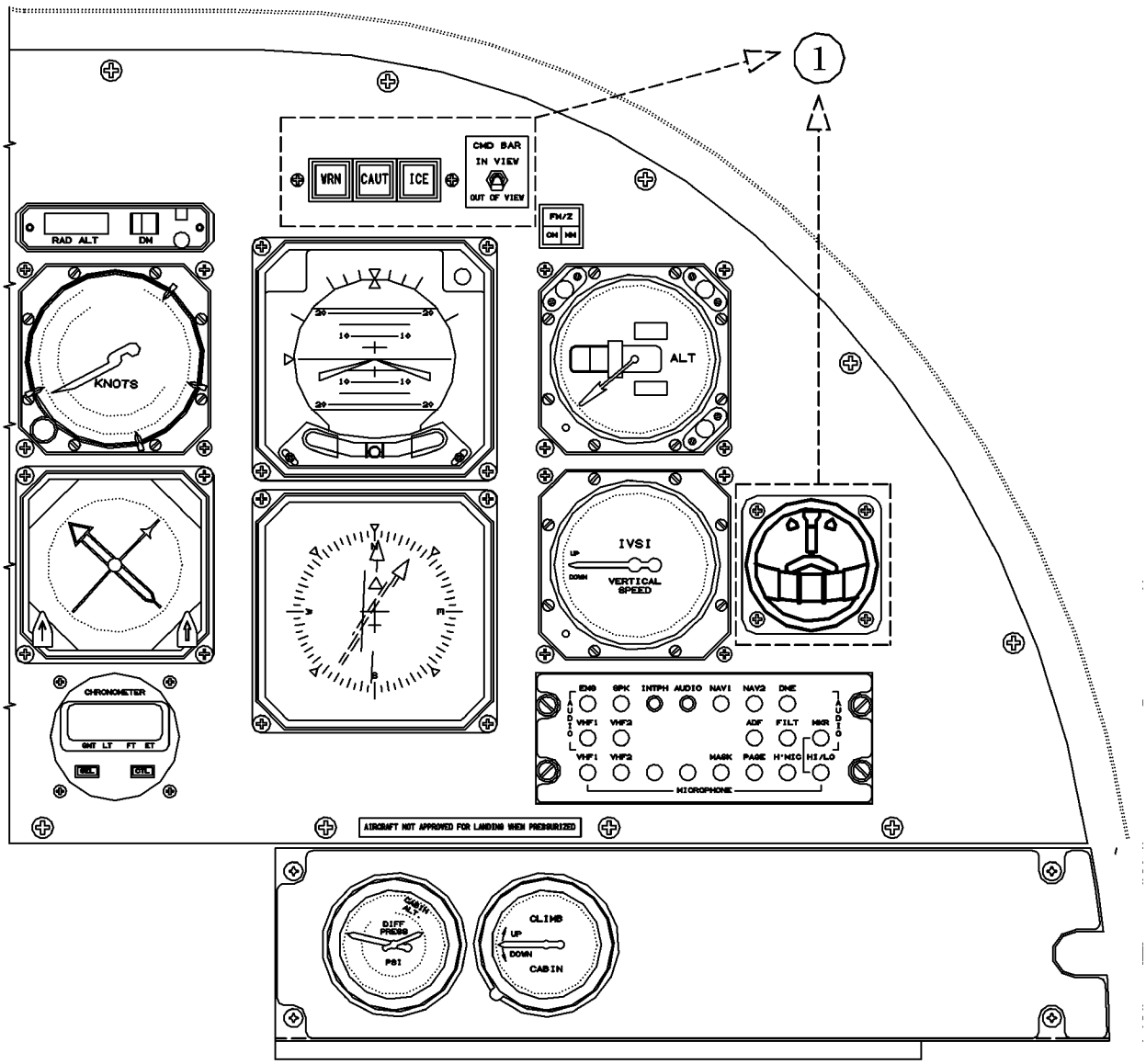
Figure 7-3. TYPICAL INSTRUMENT PANEL - CENTER SECTION



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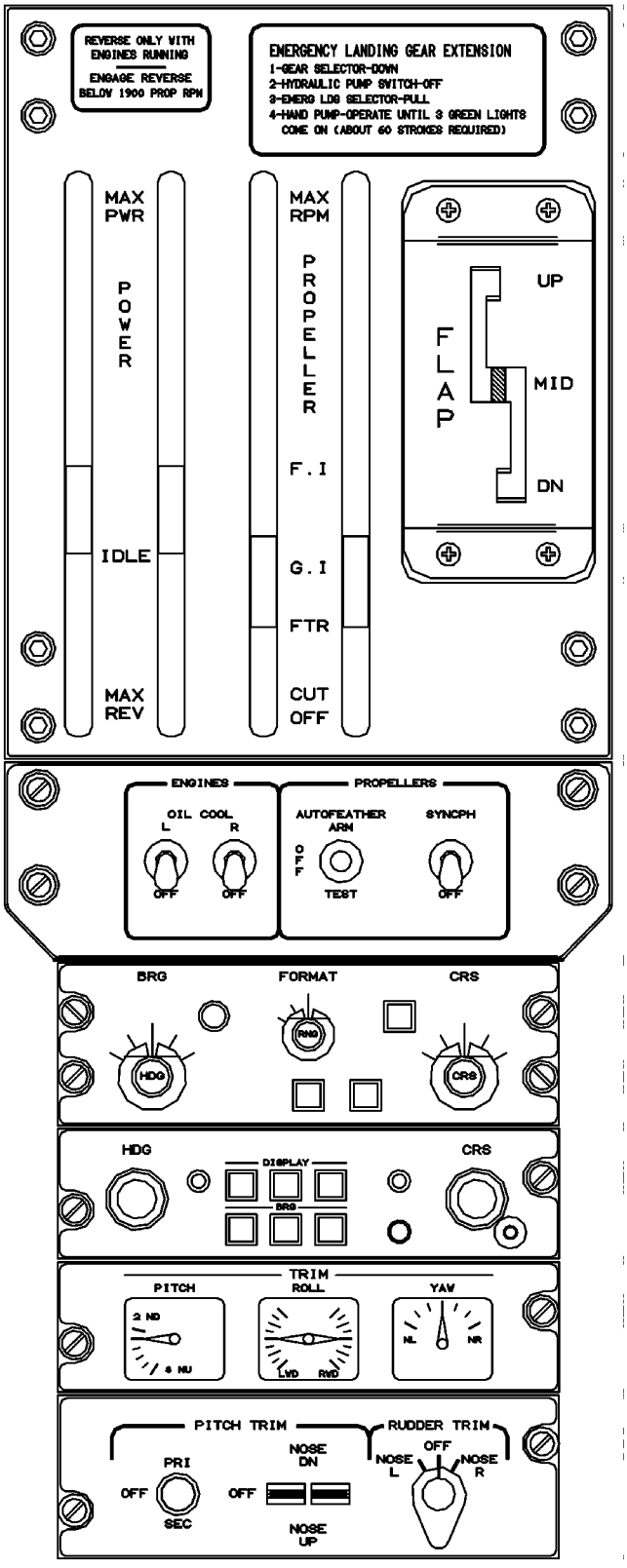
NOTE 1: For two crew operations only.

Figure 7-4. TYPICAL INSTRUMENT PANEL - RIGHT SECTION



FM_7_5

Figure 7-5. TYPICAL CONTROL PEDESTAL

7.4 INSTRUMENT PANEL

Complete instruments and avionics for VFR and IFR are located on the instrument panel and on the center pedestal.
Flight instruments are provided on the left and the right instrument panel section for the pilot and copilot. The center section of the instrument panel accomodates the power plant monitoring gauges on the left, the radio navigational and communications instruments as well as the radar installation on the right, and the annunciator panel on the center.
Other installations on the instrument panel include the Multi Function Display Indicator (MFDI) and a digital clock. A second digital clock can be installed as optional equipment.
Extending across the lower section of the instrument panel are installed various system controls, control panels, and gauges. These include external light switches panel, anti-ice systems control panel, systems test selector, master switches panel, landing gear and hydraulic system control panel, flaps position indicators, environmental and bleed air control panel, and cabin pressurization control panel.
Additional instrumentation includes a magnetic compass mounted on the windshield divider. The internal lights control and dimming panel is located on the left side wall of the cockpit.

Fuel, engine, and propeller control panels, pitch and rudder trim control panel, and trim position indicators are located on the center pedestal.

7.5 ANNUNCIATOR SYSTEM

The annunciator system provides visual indication of the condition of certain systems essential to the operation of the airplane. The annunciator system consists of an annunciator controller, sensors on the monitored systems, an annunciator display, a master warning light/reset button (WRN) and a master caution light/reset button (CAUT) directly in front of the pilot. All the lamps housed in the annunciator panel, master warning and master caution indicators and autopilot controller (if installed) can be tested selecting the ANN LTS position on the SYS TEST panel, at the base of the pilot instrument panel, and pressing the button.
In addition, this test allows the check of the door open and door closed monitoring circuit, depending on the door condition at the time of the test.

The annunciator display is located at center of the instrument panel. All of the individual function red-warning, amber-caution, green-advisory lights are dual-bulb, word readout type. The annunciator display table (Figure 7-6 on page 7-13) illustrates the function associated with each light.

When a system condition activates a red warning annunciation the red warning master light will flash simultaneously. When a system condition activates an amber caution annunciation the amber caution master light will lit simultaneously. When the illuminated master light/reset button is pressed, the master light is turned off. However, as long as the condition exists, the warning or caution annunciation will remain lit. Any subsequent activation of a red warning or an amber caution annunciator will trigger the corresponding master light again. The master light may be cancelled again by depressing the master light/reset button. If an event triggers a warning or a caution annunciation and the event is subsequently corrected, the display for the involved system will automatically extinguish.
The green advisory lights display operating situation of the related systems. No master light is associated with the advisory lights.

ANNUNCIATOR DISPLAY

1. WARNING - Red Lights

L FIRE	Fire in left engine compartment
R FIRE	Fire in right engine compartment
L OIL PRESS	Low oil pressure in left engine
R OIL PRESS	Low oil pressure in right engine
L BLEED TEMP	Left bleed air line overtemperature
R BLEED TEMP	Right bleed air line overtemperature
L MN WG OVHT	Left main wing anti-ice overheat
R MN WG OVHT	Right main wing anti-ice overheat
L FD WG OVHT	Left forward wing anti-ice overheat
R FD WG OVHT	Right forward wing anti-ice overheat
L WSHLD ZONE	Left windshield zone overheat
R WSHLD ZONE	Right windshield zone overheat
BAG DOOR	Baggage door open or not secure
CAB DOOR	Cabin door open or not secure
DUCT TEMP	Cabin air supply duct overtemperature
STEER FAIL	Steering system failure
CAB PRESS	Cabin pressurization outside limits
BAT OVHT	Battery overheat above 150°F

2. CAUTION - Amber lights

L F/W V INTRAN	Left fuel firewall shut off valve in transit
R F/W V INTRAN	Right fuel firewall shut off valve in transit
L F/W V CLSD	Left fuel firewall shut off valve closed
R F/W V CLSD	Right fuel firewall shut off valve closed
L FUEL PUMP	Left main fuel boost pump inoperative
R FUEL PUMP	Right main fuel boost pump inoperative
L FUEL PRESS	Left fuel pressure below minimum
R FUEL PRESS	Right fuel pressure below minimum
L FUEL FILTER	Left fuel filter obstructed
R FUEL FILTER	Right fuel filter obstructed
FUEL XFEED	Fuel crossfeed valve open
XFEED INTRAN	Fuel crossfeed valve in transit
L LOW FUEL	Minimum fuel level in the left tank
R LOW FUEL	Minimum fuel level in the right tank
BAT TEMP	Battery temperature above 120°F
BUS DISC	Electrical busses not interconnected
L GEN	Left DC generator inoperative
R GEN	Right DC generator inoperative
PRI INV	Primary inverter inoperative
SEC INV	Secondary inverter inoperative
AVCS FAN FAIL	Failure of main avionics bay cooling fan
HYD PRESS	Hydraulic pressure outside range or (*) Hydraulic System inoperative
ADC FAIL	Failure of the Air Data Computer
FLAP SYNC	Flap synchronization failed
STALL FAIL	Stall warning system failure or angle of attack transducer heater inoperative
OIL COOLING	Forced engine oil cooling operating
L PROP PITCH	Left propeller beyond low pitch stop
R PROP PITCH	Right propeller beyond low pitch stop
AUTOFEATHER	Autofeather not armed
DOOR SEAL	Failure of cabin door sealing

(*) For S.N. 1058 and up airplanes or with SB-80-0166 embodied

(cont'd)

(cont'd)

3. **ADVISORY - Green Lights**

L AUTOFEATHER	**Left autofeather operative**
R AUTOFEATHER	**Right autofeather operative**
L FD WG A/ICE	**Left forward wing anti-ice operating**
R FD WG A/ICE	**Right forward wing anti-ice operating**
L MN WG A/ICE	**Left main wing anti-ice operating**
R MN WG A/ICE	**Right main wing anti-ice operating**
L ENG/OIL A/I	**Left engine ice vane open and oil cooler anti-ice operating**
R ENG/OIL A/I	**Right engine ice vane open and oil cooler anti-ice operating**
EXT POWER	**External power unit plugged in and operative**
LTS DOOR OPEN	**Landing/taxi lights door open**

FM_7_6

Figure 7-6. ANNUNCIATOR DISPLAY

7.6 AURAL WARNING SYSTEM

The aural warning system provides generation of different aural tones in conjunction with particular events requiring the pilot to be alerted. The system consists of an electronically controlled unit that generates the following audible warnings:

WARNING	TONE
STALL	Priority 1. Downward sweeping frequency from 1280 Hz to 830 Hz, with a repetition rate of 2.0 seconds. The input control is from the stall warning computer when a prestall condition is detected.
OVERSPEED	Priority 2. Upward sweeping frequency from 1900 Hz to 3000 Hz, with a repetition rate of 1.5 seconds. The input control is from the pilot airspeed indicator at speed above either 260 KIAS for flight altitudes up to 28450 ft or 0.67 indicated Mach above 28450 ft.
GEAR	Priority 3. Steady 326 Hz frequency. Activated by inputs from power levers, flaps, landing gear and TEST/MUTE functions as follows: – the power on one or both of the engines is reduced below a setting sufficient to maintain flight while the landing gear is not locked down. The GEAR WARNING can be silenced by means of the GEAR MUTE switch on the right power lever (left on the airplanes S.N. 1004 to 1021 <u>without</u> S.B. 80-0040). *Airplanes <u>without</u> S.L. 80-0020.* – the flaps are lowered to the DN position and the landing gear is not locked down. The GEAR WARNING cannot be silenced and will continue until either the landing gear is extended or the flaps are retracted to the clean (UP) setting. – the flaps are in MID position, the landing gear is not locked down and the left power lever is retarded approximately below the half travel position. The GEAR WARNING cannot be silenced and will continue until either the landing gear is extended or the flaps are retracted to the clean (UP) setting.

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Airplanes incorporating S.L. 80-0020.

- the flaps are lowered to the MID or DN position and the landing gear is not locked down. The GEAR WARNING cannot be silenced and will continue until either the landing gear is extended or the flaps are retracted to the clean (UP) setting.
- the flaps are in MID position and the landing gear is retracted at the takeoff. The GEAR WARNING will be activated after approximately 25 seconds the landing gear is retracted and will continue until the flaps are retracted to the clean (UP) setting. No GEAR WARNING sound will be generated if the flaps are retracted within the 25 seconds delay.

* * * * * *

TRIM-IN-MOTION

Priority 4. A clock-like tick resulting from short bursts of 1000 Hz (5 cycles), with a repetition rate of 0.3 seconds.
The input control is from the primary pitch trim actuator when in motion.

AUTOPILOT DISCONNECT

Priority 5. A 500 Hz frequency that fades to inaudible in 1.0 second.
Activated when the autopilot disengages.

ALTITUDE ALERT

Priority 6. A 3000 Hz frequency with an approximate duration of 1 second that activates either 1000 ft before the preselected altitude is reached (acquisition mode) or when the flying altitude differs by ± 200 ft from the preselected value (deviation mode).
The input control is from the Altitude Preselector.

With the exception of the GEAR WARNING, the above output tones can be silenced only by removing and/or correcting the generating event.

The control inputs are prioritized such that if two or more inputs are activated, only the higher priority tone will be sounded. In the case where the GEAR WARNING tone is silenced the next priority tone would sound during the silenced period.

The aural warning box is fed from the essential bus through the AURAL WRN 3-ampere circuit breaker on the pilot circuit breaker panel.

7.7 MULTI FUNCTION DISPLAY INDICATOR

A Multi Function Display Indicator (MFDI) is located on the left section of the instrument panel. The MFDI allows monitoring the electrical system load and voltage, the battery temperature and the outside air temperature with a digital presentation of the measured values.

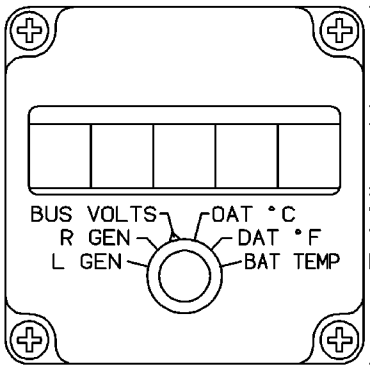

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Figure 7-7. MULTI FUNCTION DISPLAY INDICATOR

A rotating selector knob in the lower part of the indicator converts the indicator display to the desired function reading when rotated to the corresponding position. The following reading can be selected:

L GEN	Left generator output current (Amps)
GEN	Right generator output current (Amps)
BUS VOLTS	D.C. electrical system voltage measured at the essential bus
OAT °C	Outside air temperature in Celsius degrees
OAT °F	Outside air temperature in Fahrenheit degrees
BAT TEMP	Battery temperature in Fahrenheit degrees

In the event the measured currents are above the maximum allowed value the WARN reading will appear on the display, alternatively to the displayed function and independently from the selector position.
The MFDI, integrated in the battery temperature monitoring system, drives the BAT OVHT red warning light and the BAT TEMP amber caution light, located on the annunciator display panel.

A self test routine is automatically performed any time the unit is powered (battery switch set to BAT). In this phase all the sixteen segments of each display shall light in sequence and simultaneously the decimal point shall illuminate.

D.C. electrical power is supplied to the MFDI from the essential bus through the MFDI and BAT TEMP 3-ampere circuit breakers on the pilot circuit breaker panel.

7.8 SYSTEM TEST

A central test system allows checking the correct operation of some airplane systems. The SYS TEST selector, located on the lower section of the instrument panel, consists of a rotary knob with a central pushbutton. The rotary knob selects the system to be tested when rotated to the corresponding position while the springloaded pushbutton actuates the selected system test when pushed and held.

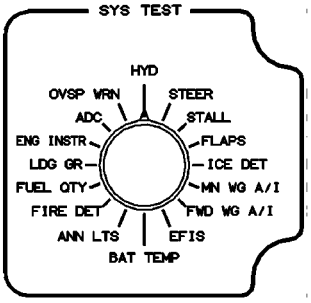

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Figure 7-8. SYSTEM TEST SELECTOR

The following tests can be performed as per the selector position:

SELECTOR	TEST
BAT TEMP	Battery temperature system test. Simulation of overtemperature and check of the temperature monitoring circuit.
ANN LTS	Annunciator system test. The MASTER WARNING, the MASTER CAUTION and all of the annunciator panel lights should come on. The two MASTER lights must be manually reset after the test.
FIRE DET	Engine fire warning system test. The continuity of both the right and the left engine fire detecting circuits will be checked: the L ENG FIRE and R ENG FIRE red warning lights should flash. If the optional fire extinguishing system is installed, the two lighted L and R ENG FIRE EXT pushbuttons, located each side of the Autopilot controller panel, will flash too.
FUEL QTY	Fuel quantity indicating system test. The needle of the both fuel quantity indicators should move to full scale, then move back to zero and then return to the actual quantity reading. The instrument digital indicator should display "8888" and the L and R LOW FUEL amber caution light should illuminate into the range corresponding to the low fuel condition.
L DG GR	Landing gear indicating system test. The UNSAFE red and LOCKED DN green lights should illuminate and the gear warning tone should be activated.
ENG INSTR	Engine instruments digital indicator test. The digital indicator of the instruments should display "888"

ADC	Air data computer test. The ADC FAIL amber light will illuminate then extinguish while the air data instrument flags come into view and the instruments go into the loss-of-data display mode. Refer to Supplement No. 2 for more information of this POH.
OVSP WRN	Overspeed warning test. The "overspeed warning" aural tone should be generated.
HYD	Hydraulic power package and hydraulic pressure monitoring system test. The needle of the hydraulic pressure indicator should move to the 1000 PSI reading while the HYD PRESS amber caution light on the annunciator display should come on.
STEER	Steering system test. The STEER FAIL red warning light on the annunciator display should come on when the steering is engaged in either takeoff or taxi operating mode, and should go off by depressing the Master Switch (MSW) on the control wheel: at this point the steering mode lights also will go off indicating that the steering is no more engaged.
STALL	Stall warning system test. A signal of "test request" is sent to the stall warning computer that simulates a failure of the angle of attack (AOA) transmitter: STALL FAIL amber light will illuminate then extinguish after 15 to 20 sec. Red STALL light will be illuminated and the aural warning horn activated.
FLAPS	Flaps system test. The timing circuitry, the electrical power feeding, the electrical contacts on the main wing outboard flap (MWOF) subsystem control, the FLAP SYNC amber caution light and the related driving unit are checked for correct operation and continuity. The FLAP SYNC light should illuminate.
ICE DET	Ice detector test. ICE amber light will illuminate and after few seconds, extinguish.
MN WG A/I	Main wing anti ice system test. After setting to the AUTO position the ANTI-ICE MAIN WING switches, depressing the test button, the L MN WG A/ICE and the R MN WG A/ICE green advisory lights on the annunciator display should come on. At the end of the test the ANTI-ICE MN WING switches should be reset to the OFF position.
FWD WG A/I	Forward wing anti ice system test. After setting on the ANTI-ICE FWD WING switches, depressing the test button a load increase of about 70 Amps. on each generator should be read on the multi function display indicator. At the end of the test the ANTI-ICE FWD WING switches should be reset to the OFF position.
EFIS	Electronic flight instrument system test. The self-test simulates increments of the current values of pitch, roll and heading. The word TEST appears on the primary flight display (PFD) and on the multifunction display (MFD) and the warning comparator messages (PIT, ROL, HDG) will flash. Refer to Supplement No. 3 of this POH for more information.

7.9 GROUND TEST/REFUEL PANEL

The ground test/refuel panel performs the following indications, tests, and operations:

- display of the low oil level condition in the left and in the right engine, and annunciators driving circuitry test
- controlled display of the metallic chip detection condition in the left and right engine oil, when the upgraded GT&RP - P/N 727-0439/02 - is installed (Modification No. 80-0467 or Service Bulletin No. 80-0194)
- display of the hydraulic system fluid low level condition and sensor test
- display of the hydraulic system fluid filter obstruction and latching circuitry test/reset
- monitoring and operation of fuel tank systems interconnect valve
- refueling system test

The panel consists of a GROUND TEST switch, a REFUEL control switch, red-warning lights and amber-caution lights.
All the lights are word readout type. The following list illustrates the function associated with each light:

L ENG OIL	(Red)	Low oil level in left engine Chip detection condition in left engine oil (Mod. No. 80-0467 or SB No. 80-0194 embodied)
R ENG OIL	(Red)	Low oil level in right engine Chip detection condition in right engine oil (Mod. No. 80-0467 or SB No. 80-0194 embodied)
HYD LEVEL	(Red)	Low fluid level in hydraulic system
HYD FILTER	(Red)	Hydraulic fluid filter obstruction
TANK INTCON	(Amber)	Fuel systems interconnecting valve in open position
TK INTCON INT	(Amber)	Fuel systems interconnecting valve in transient

The two-momentary-position GROUND TEST switch allows performing the panel lights test when moved to the LAMP position: all lights should illuminate. Moving and holding the switch to the SYST position all the red-warning lights should illuminate in few seconds then should go off when the switch is released to center position: failure of a light to illuminate will detect a malfunction in the corresponding monitoring system circuitry.

When the upgraded ground test/refuel panel is installed (Mod. No. 80-0467 or SB No. 80-0194), a dual engine oil condition monitoring function is associated with the L and R ENG OIL annunciator lights:

- engine oil level condition (automatic display)
- engine oil chip detection condition (controlled display)

When the GROUND TEST switch is moved and held to the LAMP position, the L and R ENG OIL lights should flash with a rate of 3 Hz. (60% on and 40% off) showing the proper operation of the chip detection monitoring circuitry.
When the GROUND TEST switch is moved and held to the SYST position, all the red-warning lights should steady illuminate in a few seconds then should go off releasing the switch.

CAUTION

If the L or R ENG OIL annunciator light is flashing, with a rate of 3 Hz. (40% on and 60% off), while the GROUND TEST switch is held in the SYST position, a real chip detection condition occurs in the related engine oil. An immediate engine maintenance check is required as per the applicable Engine Manual.

The two-position REFUEL OPEN-CLOSED switch controls the left and right fuel systems interconnecting valve allowing the single point refueling. Setting the switch to the OPEN position the interconnecting valve opens: the TK INTCON INT amber light momentarily comes on then goes off when the valve is completely open and the TANK INTCON amber light comes

on. When the control switch is set to the CLOSED position the TANK INTCON light goes off then the TK INTCON INT light momentarily comes on until the valve is completely closed.

CAUTION

The fuel systems interconnecting valve must be open for refueling operations only. Close the valve after the refueling has been completed.

When the pressure refueling system is used, the "full-tanks" valve that detects the complete filling condition of the fuel tank system and provides the automatic stopping of the refueling must be checked for correct operation, in the first phase of the refueling, by moving to the SYST position the GROUND TEST switch: the refueling flow should stop quite immediately. Releasing the GROUND TEST switch to the center neutral position the refueling flow should resume.

The access to the ground test/refuel panel can be gained through a side-hinged door on the right side of the fuselage under the wing. The access door can be closed only if the REFUEL control switch is lowered to the CLOSED position: a safe-guard detent prevents the door from closing if the REFUEL switch is raised to the OPEN position.

The ground test/refuel panel operates on the hot battery bus through the 3 Amp. GRD TEST PANEL and the 5 Amp. REFUEL circuit breakers located in the main junction box circuit breakers panel in the baggage compartment.

7.10 ENGINES

The airplane is powered by two counter-rotating Pratt & Whitney PT6A-66 turboprop engines, each flat rated to 850 SHP. The rated power can be maintained during cruise to approximately 25,000 feet on a standard day.

Inlet air enters the engine through an annular plenum chamber, formed by the compressor inlet case. The four-stage axial and single-stage centrifugal compressor is driven by a single-stage turbine. Downstream the compressor the air is routed through diffuser tubes to the combustion chamber liner. The flow of air changes direction of 180 degrees as it enters and mixes with fuel. The fuel/air mixture is ignited by two spark igniters, which protrude into the combustion chamber, and the resultant expanding gases are directed to the compressor turbine and then to the power turbine. The compressor and power turbines are located in the approximate center of the engine with their respective shafts extending in opposite directions.
The exhaust gas from the power turbine is collected and ducted in the bifurcated exhaust duct and directed to atmosphere via twin opposed exhaust stubs.

The fuel supplied to the engine from the airplane fuel system is routed through an oil-to-fuel heater to an engine-driven fuel pump where it is further pressurized. The fuel pump delivers the fuel to a fuel control unit, which determines the correct fuel schedule for engine steady state operation, both with and without power augmentation and acceleration. A flow divider supplies the metered fuel flow to the primary or to both primary and secondary fuel manifolds as required. Fuel is sprayed into the annular combustion chamber through fourteen simplex fuel nozzles arranged in two sets of seven and mounted around the gas generator case.

All engine-driven accessories, with the exception of the propeller governor, overspeed governor and propeller tachometer-generator, are mounted on the accessory gearbox at the rear of the engine. These components are driven by the compressor by means of a coupling shaft which extends to drive through a tube at the center of the oil tank.
The engine oil supply is contained in an integral oil tank which forms the rear section of the compressor inlet case.

The dual-stage power turbine, counter-rotating with the compressor turbine, drives the propeller through a two-stage reduction gearbox located at the front of the engine. The gearbox is counterclockwise rotation propeller drive for the right mounted engine, and clockwise drive for the left mouted engine. An integral torquemeter device is embodied in the gearbox. A chip detector is installed at the bottom of the gearbox.

The propeller control system comprises the single-acting hydraulic propeller governor, which combines the functions of constant speed unit, blade pitch control and fuel reset valve (beta), and the coordinating system which includes the beta lever, the beta cam and the related cables and rods.

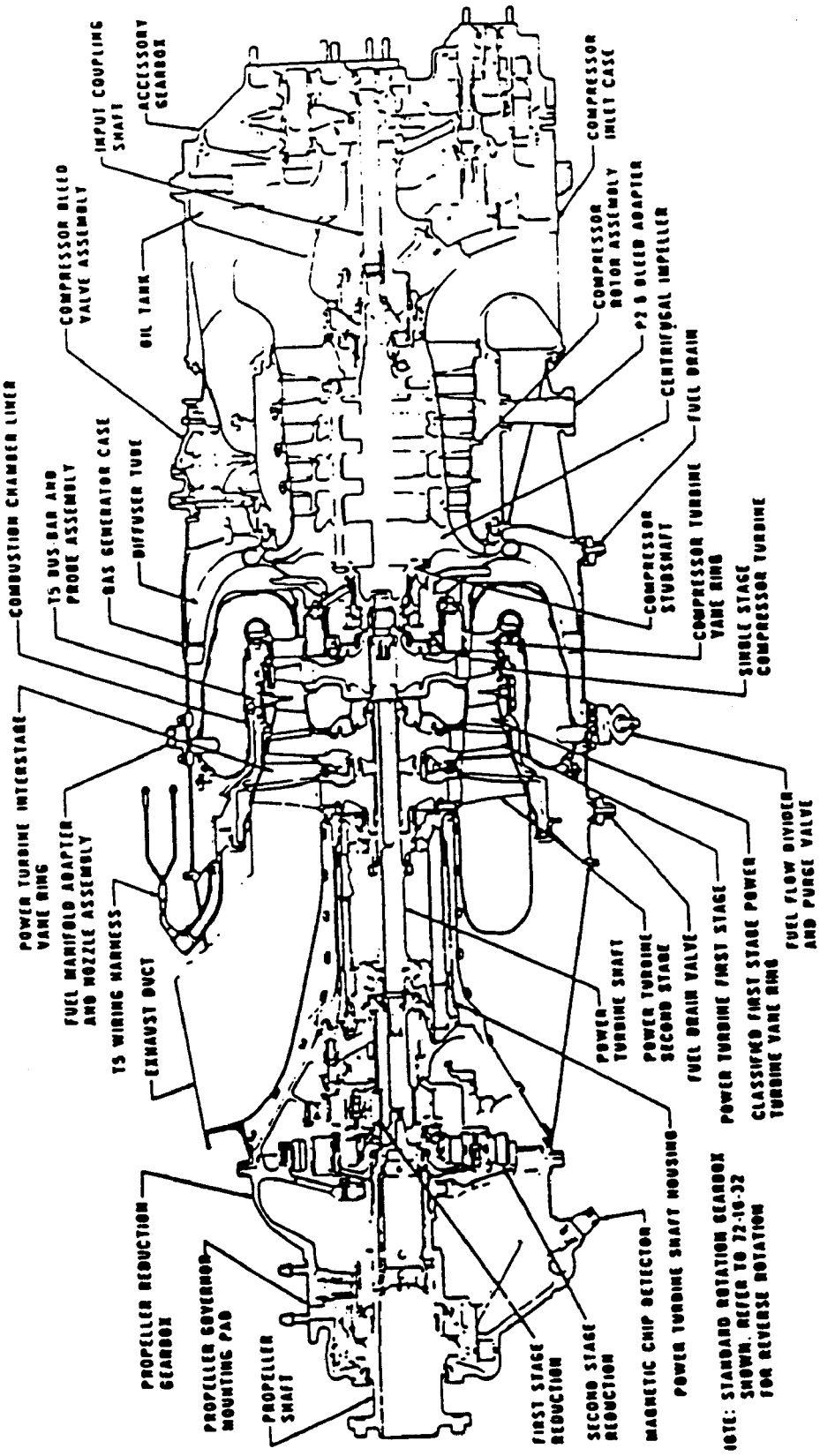

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Figure 7-9. POWER PLANT

7.10.1 ENGINE FUEL SYSTEM

The engine fuel system consists of an oil-to-fuel heater, an engine driven fuel pump, a fuel control unit, a flow divider and purge valve, a dual fuel manifold with 14 nozzles, and two fuel drain valves.

Fuel from the oil-to-fuel heater enters the gear-type pump through an inlet screen. The pump gears increase the fuel pressure and deliver it to the fuel control unit through a pump outlet filter. A by-pass valve in the pump body enables unfiltered high pressure fuel to flow to the fuel control unit in the event of the outlet filter becoming blocked.

The fuel control unit schedules the fuel flow to the engine according to the operating conditions and position of the cockpit engine controls. The fuel control unit comprises a fuel condition lever that selects the start, low idle and high idle functions, a power lever that selects the gas generator speed between high idle and maximum, a flyweight governor that controls fuel flow to maintain the selected speed, and pneumatic bellows that control the acceleration schedule and act to reduce the gas generator speed in the event of propeller overspeed.

A fuel flow transmitter is installed downstream the fuel control unit. The metered fuel flow is then delivered to the flow divider and purge valve. The flow divider schedules the fuel flow between the primary and secondary fuel manifolds. During engine start-up, metered fuel is delivered initially by primary nozzles, with the secondary nozzles cutting in above a preset value. All nozzles are operative at idle and above.
On engine shutdown the purge valve allows compressed air to flush the residual fuel from the manifolds into the combustion chamber, where it is ignited and burned off.

The combustor drain valve ensure that all residual fuel accumulated in the bottom of the combustor case drains overboard in the event of an engine aborted start.

7.10.2 IGNITION SYSTEM

The spark-type ignition system consists of one exciter, two ignition leads, and two spark igniters for each engine. Ignition is by both igniters simultaneously. When the ignition switches, labeled L or R IGN-NORM, on the pedestal ENGINES control panel, are set to NORM position, the igniters will operate automatically to start the combustion.
Ignition to the engines may also be actuated manually by moving the switches to the IGN position.

D.C. power is delivered to the exciter of each engine from the essential bus through the 7.5-ampere IGN SYS circuit breaker on the pilot circuit breaker panel.

7.10.3 LUBRICATION SYSTEM

The engine oil system provides a constant supply of oil for lubricating the engine bearings, the reduction gears, the accessory drives, and for operating the torquemeter system and the propeller pitch control. Pressure oil is circulated from the integral oil tank through the lubricating system by a gear-type main pressure pump mounted at the bottom of the tank. An engine-mounted oil filter downstream of the pressure pump ensures that the engine oil remains free of contaminants. The oil filter incorporates an internal by-pass feature. Two double-element scavenge pumps, one mounted within the accessory gearbox and the other one externally mounted on the gearbox, are provided: oil that collects into the reduction gearbox sump is forced back to the oil tank via an oil cooler, oil that collects into the accessory gearbox sump is directed to the oil-to-fuel heater and then, through a thermostatic by-pass and check valve, either to the oil cooler if hot or directly to the oil tank if cold.
The oil cooler, mounted in the lower part of the engine nacelle, utilizes ram air through a flush scoop located on the outside of the engine nacelle to cool the engine oil before returning it to the oil tank. A by-pass/pressure relief valve is provided to control the oil flow through the oil cooler. A thermal operated flapper valve into the cooling air duct downstream of the oil cooler controls the air flow through the cooler. An airflow may be activated, while on the ground, through the oil cooler by means of a venturi during prolonged ground operations, if an oil overheating is observed. The motive flow (bleed air) is routed, through a shut off valve, into the cooling airflow duct, downstream of the oil cooler, to activate the flow. The electrically operated shut off valves, one for each engine are controlled through the OIL COOL L/R-OFF switches in the ENGINES control panel of the pedestal aft of the engines control levers. D.C. power is delivered to the shut off valves from the right single feed bus through the corresponding 3-ampere OIL COOLER circuit breakers on the copilot circuit breaker panel. The OIL COOLING amber caution light on the annunciator display will come on while either one or both the forced oil cooling systems are operating.
The air inlet to the engine oil cooler is protected against icing: a compressor bleed air flow is routed to heat the inlet lip when the corresponding ENG ICE VANE/OIL COOLER INTK switch is set to L and R positions. Two green advisory lights, located on the annunciator panel and labeled L and R ENG/OIL A/I, will come on and remain while the corresponding side air intake of the oil cooler is heated and reaches a preset temperature.

A chip detector is mounted in the reduction gearbox. The chip detection condition can be checked by either removing the two rear nacelle panels to access to the chip detector or, if the upgraded ground test/refuel panel is installed (with Mod. No. 80-0467 or SB No. 80-0194), moving and holding the GROUND TEST switch to the SYST position: in the event of a L or R ENG OIL light flashing, with a rate of 3 Hz. (40% on and 60% off), a real chip detection condition is shown in the corresponding engine oil.
The oil tank is provided with a filler cap and dipstick, which includes a remote indicator transmitter, located at the top of the accessory gearbox housing. Markings on the indicator dipstick correspond to U.S. quarts and indicate the amount of oil required to fill the tank to the full mark under hot and cold oil conditions. The L and R ENG OIL red warning lights, located in the ground test/refuel panel, are provided for indicating an oil low level condition: each warning light will come on when the oil level is two quarts low in the corresponding engine.

NOTE

For a correct indication the oil level must be checked within 10 minutes after the shutdown.

The L and R OIL PRESS red warning lights on the annunciator display are provided to alert the pilot if the oil pressure falls below the minimum required in the corresponding engine.

7.10.4 ENGINE INSTRUMENTATION

The engine instruments are located in a column on the left side of the center instrument panel. Identical gauges are provided for the left and right engine. The engine torque indicators are located on top followed by I.T.T. (interstage turbine temperature), propeller RPM, gas generator speed N_G, fuel flow, oil pressure and temperature (dual gauges) indicators. Torque, I.T.T., propeller RPM, N_G and fuel flow gauges provide the measured values in analogic and digital presentation.

N_G and I.T.T. gauges monitor the gas generator operation, while the power turbine is monitored by the torquemeter and propeller RPM. Engine torque is read in foot pounds. The I.T.T. indicators present the interstage turbine temperature in degrees centigrade. Interturbine temperature is monitored by means of a thermocouple probe assembly installed between the compressor and the power turbines with the sensing elements projecting into the gas path. The N_G or gas generator tachometers are read in percent of RPM, based on a figure of 37,468 RPM as 100%. The propeller tachometers are read directly in RPM. The fuel flow indicators are read in pounds per hour. The oil pressure and temperature dual gauges provide analogic reading of oil pressure in PSI and digital reading of oil temperature in degrees centigrade.

7.10.5 ENGINE FIRE WARNING

Fire warning is provided by a continuous type thermal detector running through each engine compartment around and along the engine. The pneumatic sensing element is capable of detecting a localized actual flame fire as well as a diffused overheating condition. The temperature threshold is of 545 °C on a discrete section of the detector and of 250 °C for diffused average temperature. The sensor is a sealed stainless steel capillary tube containing a core material which releases a large volume of gas when heated: the gas pressure operates a pressure switch that closes the warning circuit. Fire indication is provided by the L and R FIRE red warning lights on top of the annunciator display and, if the optional Engine Fire Extinguishing System is installed, by the two red lighted pushbuttons L and R ENG FIRE EXT located each side of the Autopilot controller panel. When the overheat or fire source is removed the inner core reabsorbs the active gas, the pressure switch opens again and the warning light goes off.

The system operation check can be performed by rotating to the FIRE DET position the SYS TEST selector on the pilot's instrument subpanel then pressing the selector inner pushbutton. The test circuit checks both the condition of the annunciator lights and the complete wire circuits to the detectors.

7.11 ENGINE ICE PROTECTION

The ice protection system of each engine consists of an engine nacelle air intake lip deicing system, an inertial separator system built into the engine air intake duct, and an anti-icing system on the air intake of the engine oil cooler.

Each nacelle air intake lip is protected by a pneumatic boot deicer operated by compressor bleed air through a pressure regulating/relief valve and a distributor valve which provides inflation and deflation of the boot. Suction for deflating and holding down the boot is supplied by an integral ejector incorporated in the distributor valve.

The deicing boots of the left and right engine nacelle air intake are actuated through a single control. The BOOTS DE ICE three position switch allows controlling the deicing boots in two modes of operation.
Setting the switch from the OFF to the TIMER position, the two distributor valves to the left and to the right engine nacelle air intake boot are operated by a single sequential timer. The operating sequence is of 5 seconds simultaneous inflation of all boots followed by 175 seconds deflation for a total time of 180 seconds per cycle. Setting the switch to the AUTO position the distributor valves are operated by an electronic control unit connected with the ice detector. The ice detector generates a 5-second electrical output pulse each time a preset thickness of ice is reached on the probe, then deices and becomes ready to icing again in about 7 seconds. The electronic control unit operates the distributor valves for a 6-seconds pressure delivery to the boots after 10 pulses from the ice detector then resets the counter.
A pressure switch, connected downstream each distributor valve, allows monitoring the inflation of the corresponding boot by switching on an advisory light. The two green lights L E and R E, respectively for the left and for the right nacelle air intake boots are located in the ANTI-ICE panel close to the system control switch.
The boot deice system is energized from the right dual feed bus through the 5-ampere BOOTS DEICE circuit breaker located on the copilot circuit breaker panel.

The inertial separator system prevents not acceptable ice accretion at the engine inlet and/or ice ingestion. A deflector vane and the coupled by-pass door are operated by an electrical linear actuator. Electrical power is delivered to the left engine nacelle actuator from the left dual feed bus through the 3-ampere L ENG ICE VANE circuit breaker on the pilot circuit breaker panel and to the right engine nacelle actuator from the right dual feed bus through the 3-ampere R ENG ICE VANE circuit breaker on the copilot circuit breaker panel.

Compressor bleed air is derived from each engine to the corresponding oil cooler air inlet for ice prevention. Bleed air delivery to the air inlets is controlled through electrically actuated shutoff valves.

Electrical power is supplied to these shutoff valves from the right single feed bus through the 3-ampere L and R OIL COOLER circuit breakers on the copilot circuit breaker panel.

The two-position switches L and R ENG ICE VANE/OIL COOLER INTK simultaneously control the inertial separator system actuator and the oil cooler anti-icing valve of the corresponding left or right engine. Setting the switches to L and R positions the deflector vanes and the by-pass doors are extended in about 20 seconds while the oil cooler anti-icing valves open. The L and R ENG/OIL A/I green advisory lights on the annunciator display illuminate when the corresponding inertial separator vanes are extended and the air temperature in the oil cooler intake lip reaches a preset value. A malfunction of either system causes the extinguishing of the green light and the flashing of the amber ICE light.

NOTE

A torque drop will be noted when the deflector vane and the by-pass door are extended.

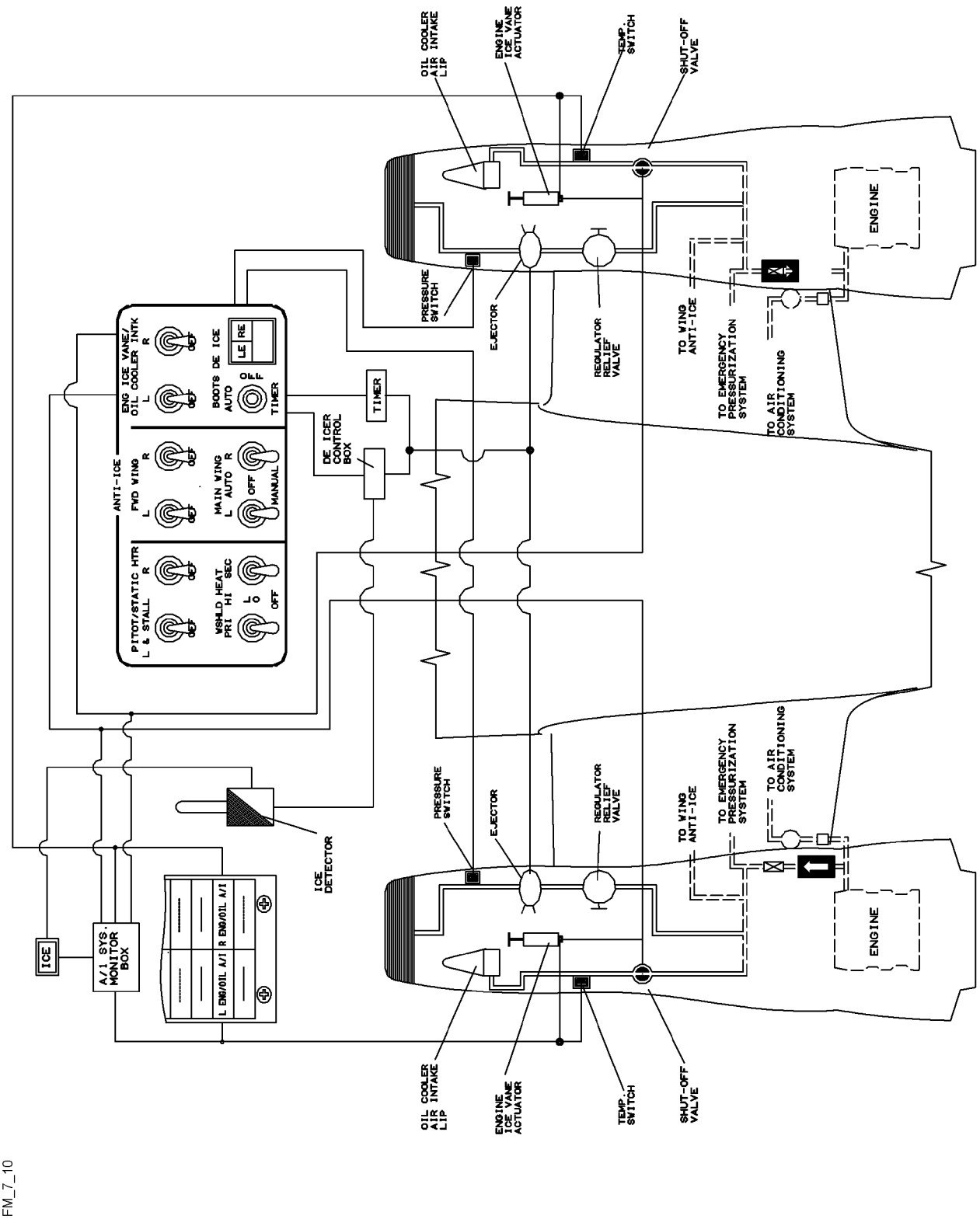

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Figure 7-10. ENGINE ICE PROTECTION

7.12 PROPELLERS

The pusher propellers are Hartzell counter-rotating, five blade, 85 inch diameter, single acting, constant speed, reversing and full feathering type. The all metal construction propellers are flange mounted on the engine shaft. Propeller speed is kept constant by a governor which controls the pressure of engine oil to the propeller pitch change mechanism. The propeller governor, provided with an integral Beta valve, is installed on the front case of the reduction gearbox and is driven by the propeller shaft through an accessory drive shaft. When the oil pressure generated and controlled by the governor is increased, the blades are moved toward the low pitch (increase RPM) down to the hydraulic stop and through the Beta system to the reverse position. When the oil pressure is decreased, feathering springs and centrifugal counterweights allow the blades to move toward the high pitch (decreased RPM) position and into the feathered position.
The low pitch stop prevents the governor from moving the blades beyond the prescribed low pitch position separating the forward pitch range and the Beta and reverse ranges. The Beta and reverse blade angles are attained by manually overriding the low pitch stop position. This is accomplished by moving the power levers into the Beta and reverse ranges. Just after the low pitch stop position has been overriden, the L and R PROP PITCH amber caution lights of the annunciator display will come on and remain while the blade angles are in the Beta and reverse ranges.

The governor is also equipped with an airbleed orifice which serves to protect the engine against a possible propeller overspeed in the event of a primary governor failure. The orifice bleeds from the compressor discharge pressure sensor of the engine fuel control. Opening of the orifice results in a lower compressor discharge pressure signal being received in the sensor. The airbleed orifice will be opened at approximately 4% above the governor speed setting.
In the reverse thrust operation, the propeller speed adjusting linkage resets the airbleed link to a setting below the propeller governor control lever setting. Propeller speed is then controlled by the airbleed orifice and the blade pitch angle. Power supplied by the gas generator is reduced to allow a propeller speed approximately 5% under the speed set by the propeller governor.

An overspeed governor is installed on the front case of the reduction gearbox and is driven by the propeller shaft through an accessory drive shaft. The overspeed governor takes authority control the propeller speed in the event of malfunction of the primary governor or of any engine overspeed that can occur. The speed setting of the overspeed governor is approximately 2120 RPM (6% above the constant speed governor setting). The overspeed governor is provided with a solenoid operated reset valve which, when actuated, will reduce the speed setting of the overspeed governor to enable it to be checked during the runup. The solenoid reset valve is controlled through the PROP OVSP TEST LEFT-RIGHT- OFF switch located in the ENGINES panel on the control pedestal. The test speed to which the overspeed governor is reset by the solenoid reset valve is approximately 1800 to 1840 RPM (above 90% of the maximum speed setting of the constant speed governor).

7.12.1 PROPELLER AUTOFEATHER

The automatic feathering system provides a means of immediately dumping oil from the propeller servo to enable the feathering spring and counterweights to start the feathering action of the blades in the event of an engine failure. Although the system is armed by a switch in the PROPELLERS panel on the control pedestal, placarded AUTOFEATHER ARM-OFF-TEST, the completion of the arming phase occurs about two seconds after both power levers are advanced above the setting point (about 90% N_G), at that time both the right and the left advisory lights on the center display panel indicate a fully armed system. The green advisory lights are placarded L AUTOFEATHER and R AUTOFEATHER. The AUTOFEATHER amber caution light, on the center display panel, comes on, when the landing gear is in "down" position, if the autofeather system is either not armed (autofeather control switches in OFF position) or fails arming due to a malfunction or lack of electric power (pulled breaker).

The system will remain inoperative as long as either power lever is retarded below the setting position. The system is designed for use only during takeoff and landing and should be turned off when establishing climb. During takeoff or landing, if torquemeter oil pressure on either engine drops below a prescribed setting, the oil is dumped from the propeller, the feathering spring moves the blades toward feather, while the autofeather system of the other engine is disarmed. Disarming of the autofeather portion of the operative engine is further indicated when the advisory light for that engine extinguishes.

The microswitch which enables the operation of the autofeather, has a fixed position relative to the power lever, and, for the same lever setting, the power delivered by the engine is much more at low temperature than at high temperature.
For this reason, during takeoff at low temperature (below –25°C), it will be necessary to operate the main wing anti-ice and the engine ice vane systems to be sure that the autofeather is armed.

The proper operation of the system can be checked when on ground by moving momentarily the AUTOFEATHER switch to TEST; in this case the power lever may be maitained below 90% N_G.
The electrical power for operating the system is supplied from the right dual feed bus through the AUTOFEATHER 5-ampere circuit breaker on the copilot circuit breaker panel.

7.13 ENGINE CONTROLS

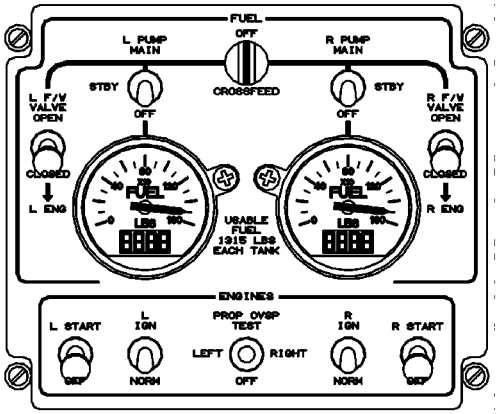
The engines and propellers are operated by two sets of controls mounted in the control pedestal below the center instrument panel. The power levers (left side of pedestal) control engine power through the full range from maximum takeoff power down to full reverse. They also select the propeller pitch (beta control) when they are moved back from the detent. A gate provides unrestricted power lever movement from idle to maximum forward but requires the power lever handle to be pulled up before movement can be made from idle to reverse. Each power lever operates the N_G speed governor in the fuel control unit in conjunction with the propeller cam linkages. Increasing N_G results in an increased engine power.
The condition levers (right side of pedestal) provide the propeller speed commands as well as the fuel cutoff and propeller feathering functions. In flight, the condition levers provide the speed commands to the propeller governor for setting the desired propeller speed. The normal operating range is from 1800 to 2000 RPM. The condition levers are utilized to select high (about 70%) or low (about 54%) idle. Ground idle (low) is the normal condition for ground operations. Flight idle (high) is needed on ground for maintaining low ITTsduring'periods of high generator loads at high ambient temperatures or when increased bleed air flow is necessary. Moving the condition lever aft from the G.I. position, over the gate, and aft to the FTR and CUT OFF results in propeller feathering and fuel cutoff.

7.14 FUEL SYSTEM

The fuel system total capacity and total usable capacity is reported in Section 2, par. 2.13, "Fuel Quantity Limitations". Each engine is fed by its own fuel system consisting of four interconnected tanks: an integral fuselage tank just above the wing, a wet wing tank extending from the wing center rib, and two fuselage collector tanks just under the wing. A crossfeed line allows feeding one side engine with the fuel from the opposite side tank. The crossfeed line connects the left and right side fuel system low pressure lines to the engine.

The left and right fuel systems are independent except during the pressure refueling operations. A valve-controlled interconnecting duct connects the left and right collector tanks allowing single point refueling. The REFUL-OPEN-CLOSED switch as well as the TK INTCON INT and TK INTCON amber lights, that provide the control and the operation monitoring, are located in the Ground Test/Refuel panel on the right side of the fuselage under the wing. A single filler opening is provided on the right side fuselage top for gravity refueling.
A single point pressure refueling adapter is provided on the right side of the fuselage just under the wing. A float valve in the fuselage tank provides automatic stop of pressure refueling when the tank system is completely filled. Correct operation of the "full-tanks" float valve can be checked during pressure refueling through the Ground Test system.
Refer to "GROUND TEST/REFUEL PANEL" paragraph of this Section and to "FUEL SYSTEM SERVICE" paragraph of Section 8 for further information about refueling description and operation.

All fuel is supplied to the engine from the fuselage collector tank. Two electrically driven submerged boost pumps, located at the bottom of the collector tank, are connected on the fuel low pressure line to the engine. One only (referred as MAIN) is normally supplying fuel to the engine driven fuel pump. The second one (referred as STANDBY) is a backup of the main. The standby boost pump automatically switches on in the event of the main boost pump failure. A check valve on each pump pressure port prevents fuel from flowing back into the collector tank through the inoperative pump. The main and the standby pump of each side fuel system are pilot controlled through a single 3-position switch. The left and right fuel system switches, labeled L and R PUMP-MAIN-STBY-OFF respectively, are located in FUEL panel on control pedestal.



FM_7_11

Figure 7-11. FUEL SYSTEM AND ENGINE STARTING CONTROLS

Switching on of the main boost pump requires the control switch to be moved from the OFF to the MAIN through the intermediate STBY position. This permits a positive functional check of the standby pump during each preflight check out. Setting of the control switch to the MAIN position actuates the main boost pump and arms the automatic switching function of the standby boost pump. The standby pump switches on when the main pump delivery pressure drops below 5.7 psi.
The L and R FUEL PUMP amber caution lights on the center display panel come on in the event the corresponding left or right fuel system main pump is inoperative (control switch in STBY position) or failed.

NOTE

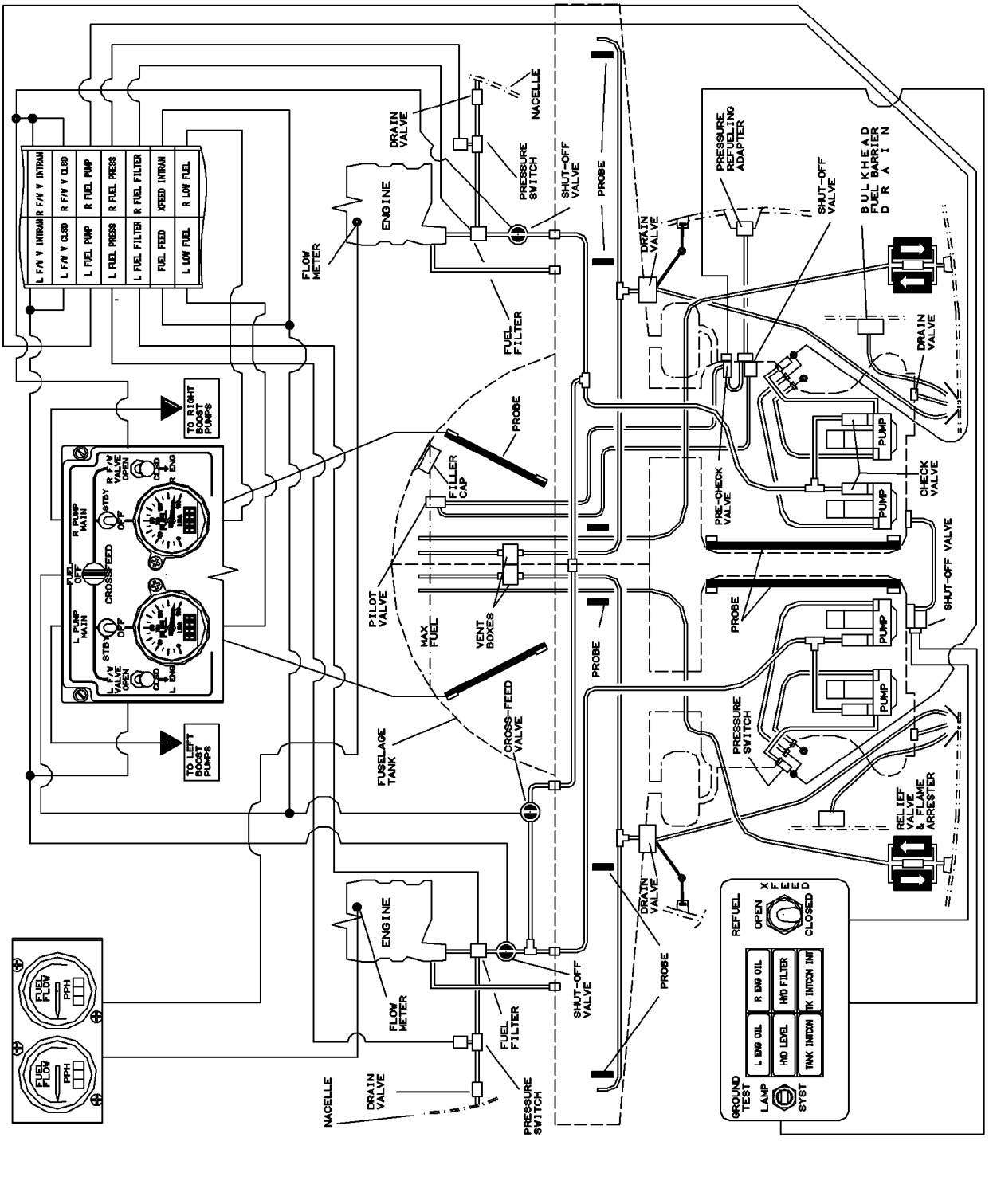
During operations on the standby boost pump, after the main boost pump failure, it is advisable to move the corresponding control switch to the STBY position.

The L and R FUEL PRESS amber caution lights on the center display panel come on in the event of both the main and the standy boost pumps of the corresponding side fuel sistem are inoperative or failed.
During operations on the main boost pump the FUEL PRESS light can illuminate alerting the pilot of either a malfunction or an impending failure of the pump before the automatic switching on the standby pump occurs: in this event it is advisable to switch on manually the standby pump moving to the STBY position the control switch.

Momentaneous illumination of the FUEL PRESS light can occur during automatic or manual switching from the main to the standby pump and viceversa.
Electrical power for operation of each fuel system main boost pump is supplied from the corresponding side generator single feed bus through the L (left) or R (right) MAIN PUMP circuit breaker (7.5-ampere circuit breakers for the electrical supply of the Romec booster pumps, 10-ampere circuit breakers for the Parker booster pumps), on the corresponding side of the cockpit circuit breaker panel. The standby boost pumps are powered from the battery bus through individual circuit breaker located on the main junction box circuit breaker panel in the baggage compartment.

Low pressure fuel from the boost pump is delivered to the engine through an electrically operated firewall shutoff valve and a fuel filter. Each shutoff valve is controlled through a two-position toggle switch labeled L (left) or R (right) F/W VALVE-OPEN-CLOSED in the FUEL control panel on the control pedestal. Moving a F/W VALVE switch from the OPEN to the CLOSED position or viceversa the corresponding L or R F/W V INTRAN amber caution light, on the center display panel, momentarily comes on during the valve gate motion, then goes off when the valve positively reaches the selected closed or open position. The L or R F/W V CLSD amber caution light comes on and remains when the corresponding side fuel firewall shutoff valve is in the closed position. Electrical power for operation of each shutoff valve is supplied from the corresponding side generator dual feed bus through the 3-ampere circuit breakers labeled L and R FW SHUTOFF on the cockpit circuit breaker panels. In the event of electrical system failure the shutoff valves are powered from the hot battery bus through individual 3-ampere circuit breakers located in the main junction box.

The fuel filter is provided with an impending by pass switch which causes the L (left) or R (right) FUEL FILTER amber caution light to come on at a preset pressure. Each side fuel system is vented through a line which connects the fuselage tank expansion space to a NACA type opening on the fuselage belly. The vent line incorporates a flame arrester with two check valves. The relief valves are set at 1.5 psi so to prevent over/under pressure inside the tank in the event of a flame arrester obstruction. A vent line interconnects the wing tank tip to the fuselage tank expansion space.



FM_7_12

Figure 7-12. FUEL SYSTEM

Three fuel drains for each side fuel system are provided, one under the collector tank is accessible through a fuselage belly opening, the second one on the vent line from the fuselage tank to the wing tank tip can be operated through a "push-to-drain" button accessible through a hole on the fuselage side below the wing, the last one on the fuel filter is of the "push-to-drain" type and is accessible through a hole on the bottom of the engine nacelle.

The fuel crossfeed is controlled through the CROSSFEED-OFF rotary knob at the center of the fuel control panel on the control pedestal. Rotating the control knob either to the left or to the right from the central OFF position the electrically driven crossfeed valve opens. The XFEED INTRAN amber caution light, on the center display panel, momentarily comes on during the valve motion, then goes off when the valve positively reaches the open position. The FUEL XFEED amber caution light comes on and remains when the crossfeed valve is in open position. The crossfeed valve should always be maintained in OFF position except during the single engine operations and/or for fuel balancing. Crossfeed operation requires that the boost pump (either MAIN or STBY) of the "not-feeding" side fuel system is set to off just after the crossfeed has been actuated. (Refer to Section 3, Emergency Procedures, for proper operation of the crossfeed system).

NOTE

Crossfeed is not approved for takeoff or landing.

Electrical power for operation of the crossfeed valve is supplied from the essential bus through the CROSSFEED 3-ampere circuit breaker on the pilot circuit breaker panel.

Two fuel flow indicators, one for each engine, are included in the engine instrument cluster. Fuel flow indication is provided, in analogic and digital presentation, in pounds per hour. Electrical power for operation of the fuel flow indicating systems is supplied from the left generator dual feed bus and from the right generator dual feed bus through the L and R FUEL FLOW 3-ampere circuit breakers respectively on the pilot and copilot circuit breaker panels.
Two fuel quantity indicators, one for each side fuel system, are included in the fuel control panel in the control pedestal. Fuel quantity is measured by a capacitance probe system and is read in pounds in either analogic or digital presentation. In addition an electrically generated "low level" signal provides the LOW FUEL amber caution light on the display panel to come on when the fuel quantity reaches the range of about 120 pounds either in the left or in the right side fuel system. The fuel quantity system can be checked for proper operation rotating to the FUEL QTY position the SYS TEST knob on the instrument panel. Refer to the Normal Procedures Section for further information about test procedure. Electrical power for operation of the quantity indicating systems is supplied from the left generator dual feed bus and from the right generator dual feed bus through the L and R FUEL QTY 3-ampere circuit breakers respectively on the pilot and copilot circuit breaker panels.

7.15 HYDRAULIC SYSTEM

The hydraulic system consists of a power package, an emergency hand pump, hydraulic lines and valves.

The hydraulic system provides power for the actuation of landing gear, of the nose wheel steering, and of the main wheels brake system.
The modular hydraulic power package, consisting of a variable displacement pump driven by an electrical motor, an integral hydraulic fluid reservoir, one solenoid-operated directional valve, a pressure transducer, and a filter with differential pressure switch, is located in the left main landing gear well just under the wing. Engine compressor bleed air is used for reservoir pressurization. The hydraulic power package is controlled through the HYD-OFF switch and monitored through a pressure gauge, located on center section of the instrument subpanel, and an amber caution light operated by a fault detection box. Gauge indication is read in psi.

The hydraulic power package operates in three different modes:

– High Duty Mode
– Low Duty Mode
– Non-operating Mode

When in high duty mode the system delivers a hydraulic pressure in the nominal range from 1800 to 3100 psi for landing gear extension and retraction only. This mode of operation is selected, with the hydraulic system control switch in the HYD position, by moving the landing gear control lever either from the DOWN to the UP or from the UP to the DOWN position: a solenoid-operated depressurizing valve converts the pump from the low to the high duty mode and viceversa, while the solenoid-operated directional valve provides the landing gear extension and retraction. When the landing gear reaches the retracted position the landing gear up stop switch stops the power package. When the landing gear reaches the extended position the landing gear down stop switches allow the power package to be converted to the low duty mode. The landing gear squat switches prevent the directional control valve from delivering high pressure hydraulic fluid to the landing gear actuators if the landing gear control lever is moved to the UP position while the airplane is on the ground.

When in low duty mode of operation the system delivers a hydraulic pressure in the range from 800 to 1200 psi for nose wheel steering and wheel brakes actuation. This is the normal ground operating mode.

The Non-operating mode is automatically selected during the flight after the landing gear has completed the retraction or by setting to the OFF position the hydraulic system control switch.

The hydraulic pump motor is connected to the right generator bus through a remote control circuit breaker controlled by the hydraulic system control switch through the HYD CONT 0.5-ampere circuit breaker on the pilot circuit breaker panel.

A pressure transducer on the pump delivery line drives the hydraulic pressure gauge via the fault detection box. An electronic circuitry which couples the transducer output signal with the operating mode information allows the HYD PRESS amber caution light on the display panel to come on when the delivery pressure is out of the range corresponding to the selected operating mode. For S.N. 1058 and up airplanes, or with Service Bulletin N. 80-0166 embodied, the HYD PRESS amber caution light comes on also when, with the gear lever set to DN, the HYD switch is set to OFF or the HYD CONT circuit breaker is pulled out.
The correct operation of the fault detection box can be checked by rotating to the HYD position then depressing the SYS TEST knob on the instrument panel. Refer to the Normal Procedures Section for further information about test procedure. Electrical power for operating the hydraulic pressure monitoring system is delivered from the essential bus through the HYD PRESS WARN 3-ampere circuit breaker on the pilot circuit breaker panel.

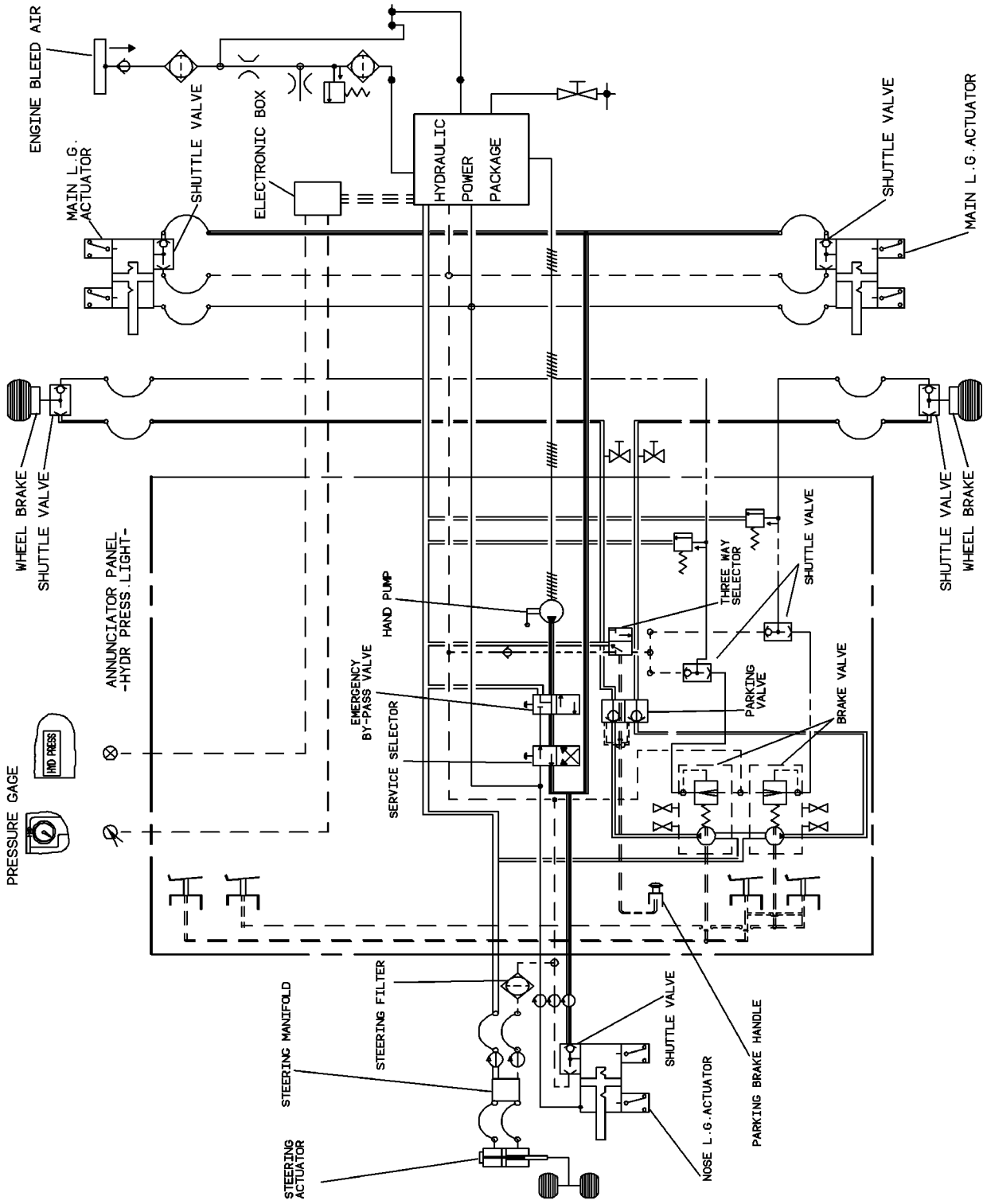


Figure 7-13. HYDRAULIC SYSTEM

A differential pressure switch, parallel connected with the hydraulic fluid filter, drives the HYD FILTER red warning light in the Ground Test/Refuel panel: when the light is on the filter element must be replaced to avoid possible filter by-pass.

The HYD LEVEL red warning light in the Ground Test/Refuel panel will come on when the "low level" probe detects an insufficient amount of hydraulic fluid in the system. Refer to Section 8 of this manual for servicing the system if a filter obstruction occurs or the hydraulic fluid reservoir needs to be refilled.

A hand pump through an independent ducting system and a landing gear emergency selector valve allows supplying hydraulic fluid pressure for extending the landing gear if either a power package failure or a severe hydraulic fluid leakage occurs: a sufficent amount of hydraulic fluid remains in the reservoir, below the motor-driven pump suction port, for the hand pump operation.

A service selector valve allows retracting and extending the landing gear using the hand pump during ground maintenance operations with the airplane on jacks. The service selector valve is not accessible during flight.

7.15.1 LANDING GEAR

The airplane is equipped with hydraulically actuated, fully retractable tricycle landing gear: the double-wheel nose gear retracting forward into the nose section and the main gear retracting rearward into the fuselage. Doors completely cover the retracted gear. The rear door of the nose gear well and the forward doors of the main gear strut wells are mechanically operated by the gear through connecting linkages and remain open when the gear is extended. The wheel well doors of the nose gear (side hinged doors) and of the main gear (aft doors),that are mechanically operated, open during gear extension and close when the gears are fully extended. All the three landing gear shock absorbers are of the air-oil type.

The nose gear is steerable through 50 degrees left and right when on taxiing and 20 degrees left and right when on takeoff.

To guard against the retraction of the landing gear when the airplane is on the ground or when the nose wheel is not centered, two squat switches (one on the nose gear and one on the right main gear shock absorber) are provided: they inhibit the hydraulic power package from supplying pressure fluid to the "up section" of the gear actuators.

All the nose and main gear actuators are fully extended when the landing gear is down and retracted when the landing gear is up. Each actuating cylinder is provided with internal up and down locks. Each lock directly actuates the switches controlling the landing gear position indicating lights. The locks are normally closed type and can be opened only by applying positive pressure. An internal shuttle valve in each actuating cylinder allows operating the landing gear extension either on the main or on the emergency hydraulic lines.

The landing gear controls and indicators are located on the LANDING GEAR panel in the center of instrument subpanel. The two position (UP and DN) landing gear control lever is just to the right of the indicator lights assemblies:

– three UNSAFE red warning lights (NOSE, LH and RH)
– three LOCKED DN green advisory lights (NOSE, LH and RH)

Each red word readout type light indicates that the corresponding gear is in motion between the "up locked" and the "down locked" position. Each green word readout type light indicates that the corresponding gear is down and locked. When the gear is up and locked, there is no light illuminated.

CAUTION

A red LH or RH light illuminated after gear extension or retraction may indicate that the corresponding side main gear rear door is not positively closed and locked. In this event the positive lock of the landing gear leg can be checked through the hydraulic pressure indication.

A 326 Hz GEAR WARNING acoustic tone will be generated when:

– the power on one or both of the engines is reduced below a setting sufficient to maintain flight while the landing gear is not locked down. The GEAR WARNING can be silenced by means of the GEAR MUTE switch on the right power lever (left on the airplanes S.N. 1004 to 1021 <u>without</u> S.B. 80-0040).

Airplanes <u>without</u> S.L. 80-0020.

– the flaps are lowered to the DN position and the landing gear is not locked down. The GEAR WARNING cannot be silenced and will continue until either the landing gear is extended or the flaps are retracted to the clean (UP) setting.

– the flaps are in MID position, the landing gear is not locked down and the left power lever is retarded approximately below the half travel position. The GEAR WARNING cannot be silenced and will continue until either the landing gear is extended or the flaps are retracted to the clean (UP) setting.

* * * * * *

Airplanes incorporating S.L. 80-0020.

– the flaps are lowered to the MID or DN position and the landing gear is not locked down. The GEAR WARNING cannot be silenced and will continue until either the landing gear is extended or the flaps are retracted to the clean (UP) setting.
– the flaps are in MID position and the landing gear is retracted at the takeoff. The GEAR WARNING will be activated after approximately 25 seconds the landing gear is retracted and will continue until the flaps are retracted to the clean (UP) setting. No GEAR WARNING sound will be generated if the flaps are retracted within the 25 seconds delay.

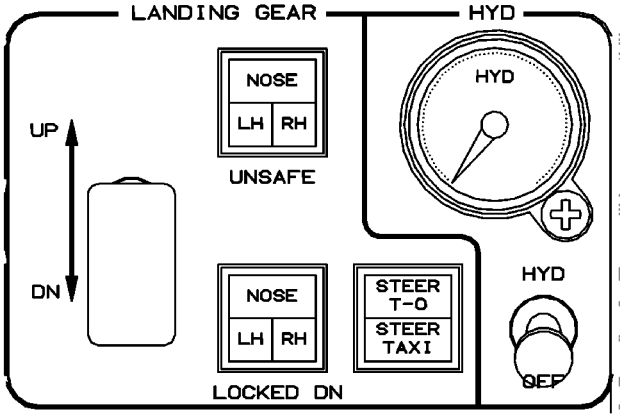
* * * * * *

The correct operation of the landing gear indicating system can be checked selecting on the SYS TEST panel the LND GR position and pressing the central button: the UNSAFE red and the LOCKED DN green lights should illuminate while the GEAR WARNING tone should be generated.

For the emergency extension of the landing gear, in the event of an hydraulic system failure due to a line breakage or a power package malfunction, a hydraulic hand pump and an emergency selector valve are provided with independent emergency lines from the fluid reservoir to the gear actuators. The emergency extension of the landing gear requires that hydraulic system control switch is set to OFF, the landing control lever is set to the DN position and the emergency selector is pulled up: the "UP section" of the gear actuators will be connected to a separated return line while the "DOWN section" will be connected to the hand pump emergency line. About 60 hand pump strokes are required for a positive lock of the gear (the three LOCKED DN green lights on).

The electrical power for the landing gear control and indication is supplied from the essential bus through the 3-ampere LDG GEAR CONT circuit breaker on the pilot circuit breaker panel.

The main gear wheels are 6.50 x 10 units fitted with 6.50 x 10 tubeless type, 12 ply rating tires. The nose gear is equipped with two 5.00 x 5 wheels fitted with 5.00 x 5 tubeless type, 8 ply rating tires.



FM_7_14

Figure 7-14. LANDING GEAR CONTROLS AND INDICATION

7.15.2 BRAKE SYSTEM

The main wheels brakes are hydraulically actuated by depressing the toe portion of either the pilot's or copilot's rudder pedals. Each carbon brake receives pressure from the corresponding metering valve which delivers hydraulic fluid pressure to the brake actuating pistons. Each brake valve, mechanically operated by the pedals, allows delivering metered pressure fluid from the hydraulic system to the brake unit proportionally to the load applied on the pedals: a compensating spring inside each brake valve contrasts the pilot action on the pedals simulating the brakes reaction.

An integral automatic diverter allows the brake valve to operate as a master cylinder when the pressure drops below 500 psi due to a hydraulic power package failure or line breakage. In this event the action on the pedals results in a fluid pressure directly applied to each brake unit through a separate emergency line: a shuttle valve is provided on each brake unit to connect the pistons to the main or to the emergency line.

CAUTION

Emergency brakes operation requires increased load is applied on the pedals.

A safety relief valve is installed on each brake main line for protecting the brake against over pressure.

The parking brake is actuated through the PARKING BRAKE handle located just below the instrument panel on the left side of the control pedestal. The handle simultaneously operates a three way selector valve and a parking brake valve.
When the hydraulic power package is operating the parking brake can be engaged by pulling out and then rotating clockwise to the vertical position the PARKING BRAKE handle: the three way selector valve connects the landing gear "down" pressure line on the brakes main lines through two shuttle valves. A non-return valve on the inlet line of the three way selector valve maintains trapped the pressure to the brakes, after the parking brake has been engaged, if the hydraulic power package is turned off.
When the hydraulic power package is not operating the parking brake can be engaged by pulling out and then rotating to the vertical position the PARKING BRAKE handle while pressing on the pedals: the parking brake valve on the emergency lines traps the pressure to the brakes: more than one action on the pedals is recommended.
The vertical position of the parking brake handle indicates that the parking brake system is engaged.
The parking brake can be released by rotating to the horizontal position and then pushing in the PARKING BRAKE handle.

7.15.3 STEERING SYSTEM

The electro-hydraulically operated nose gear steering is controlled by means of the rudder pedals. The system consists of a solenoid operated steering select valve, a servovalve, a hydraulic steering actuator and an electrical circuitry for controlling and monitoring the system in a close loop.

The steering selector valve acts as a shut-off valve. When not-energized the valve disconnects the steering system from the hydraulic system and converts the steering actuator to operate as a "shimmy damper" by connecting the "left" to the "right" section of the actuator through calibrated orifices. When energized the valve connects the hydraulic system to the servovalve which drives the steering actuator. A squat switch on the nose gear leg allows energizing the selector valve only when the airplane is on the ground while a fault monitoring circuit prevents energizing the selector valve in the event of a steering system failure. As additional safety, the electrical power to the steering system is controlled by the nose gear "down" limit switch which prevents power to be delivered to the steering control system if the gear is not locked down. The electrical power voltage which controls the servovalve is a function of the difference between the signals generated by two potentiometers: a COMMAND potentiometer, driven by the rudder pedals, and a FEEDBACK potentiometer, driven by the nose gear leg while steered.

The steering system engages after the STEERING CONTROL push button on the left handle of the pilot control wheel has been actuated. The two-momentary-position button allows selecting to different steering operating modes:

– Low gain mode for TAKEOFF operations
– High gain mode for TAXI operations

After the battery has been switched on and/or after the control wheel Master Switch has been operated, a pressure on the STEERING CONTROL button up to the first step does not engage the steering system, while pressing up to the second step, the take off mode is operative: the nose gear can be steered up to 20 deg. in both directions. The control circuitry allows a pedal travel corresponding to about 6 deg. of rudder angular travel, with no steering action. This steering delay enables the pilot to operate the rudder on cross wind takeoff or landing maintaining the nose wheel centered.
When the steering operates in take off mode the STEER TO white advisory light on the LANDING GEAR control panel illuminates.
Pressing again the button to the first step, the taxi mode is operative: the nose gear can be steered up to 50 deg. in both directions and the STEER TAXI amber light, on the LANDING GEAR panel, will flash.

The steering can be disengaged by depressing the control wheel Master Switch (MSW) on the outboard handle of both the pilot and the copilot control wheels.

NOTE

In addition to the steering system disengagement the momentary type MSW pushbutton, when depressed, will disengage the autopilot and will inhibit the primary pitch trim or rudder trim in the event of an actuator runaway.

The STEER FAIL red warning light, on the center display panel, will illuminate in the event of a steering system failure. The warning and the feedback circuitry can be checked for proper operation by rotating to the STEER position then depressing the SYS TEST knob on the instrument panel. Refer to the Normal Procedures Section for further information about test procedure.

The electrical power for the steering system control and monitoring is supplied from the essential bus through the 3-ampere NOSE STRG circuit breaker on the pilot circuit breaker panel.

7.16 ELECTRICAL SYSTEM

Electrical power is supplied by a 28 volt, direct current, negative ground electrical system. Two 28 volt, 400 ampere, D.C. starter/generators in parallel provide torque for engine starting and generate D.C. electrical power. One 25.2 volt, 38 ampere hour nickel-cadmium battery, located in the front section of the rear baggage compartment, provides power for starting and also serves as reserve source of emergency electrical power in the event of dual generator failure. The electrical system is automatically protected from overvoltage and reverse current.

An external power receptacle, located on the left side of the fuselage just above the main gear well, allows the use of an external auxiliary power source either to start the engines or to allow an extended ground check of electrical equipment.

The switches for controlling the electrical system are located in the MASTER SWITCHES panel on the left section of the instrument panel and in the ENGINES panel on the control pedestal:

- the two three-position switches, placarded GENERATOR L-OFF-RESET (left) and R-OFF-RESET (right), allow controlling the corresponding generator through individual control units
- the two-position battery switch, placarded BAT-OFF, controls the power delivery from the battery to the bus system through the battery relay
- the three-position bus switch, placarded EMER-NORM-BUS DISC, provides control of the busses interconnection system
- the AVIONICS ON-COM1 ONLY-OFF master switch controls the power delivery to the entire avionic equipment or to the primary VHF communication system only.
- the two INVERTERS switches, placarded PRI-OFF and SEC-OFF, control the power delivery to the primary and to the secondary inverter respectively
- the L START-OFF and the R START-OFF start switches control the starter operating mode of the generators.

The starting power is delivered to each starter/generator from the battery bus through individual starting relays. Momentary depressing to the START position each springloaded start switch, the corresponding starter/generator control unit initiates the starting cycle converting the generator to the starter mode and actuating the engine ignition unit. As the engine reaches the 40% N_G speed, the start switch automatically resets and the starting power is disconnected: at this point the starter/generator is driven by the engine. After the 54% N_G speed has been reached the generator can be used provided the corresponding switch is moved from the OFF to the L (or R) position.

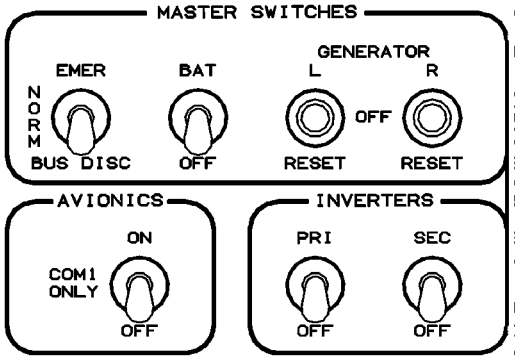


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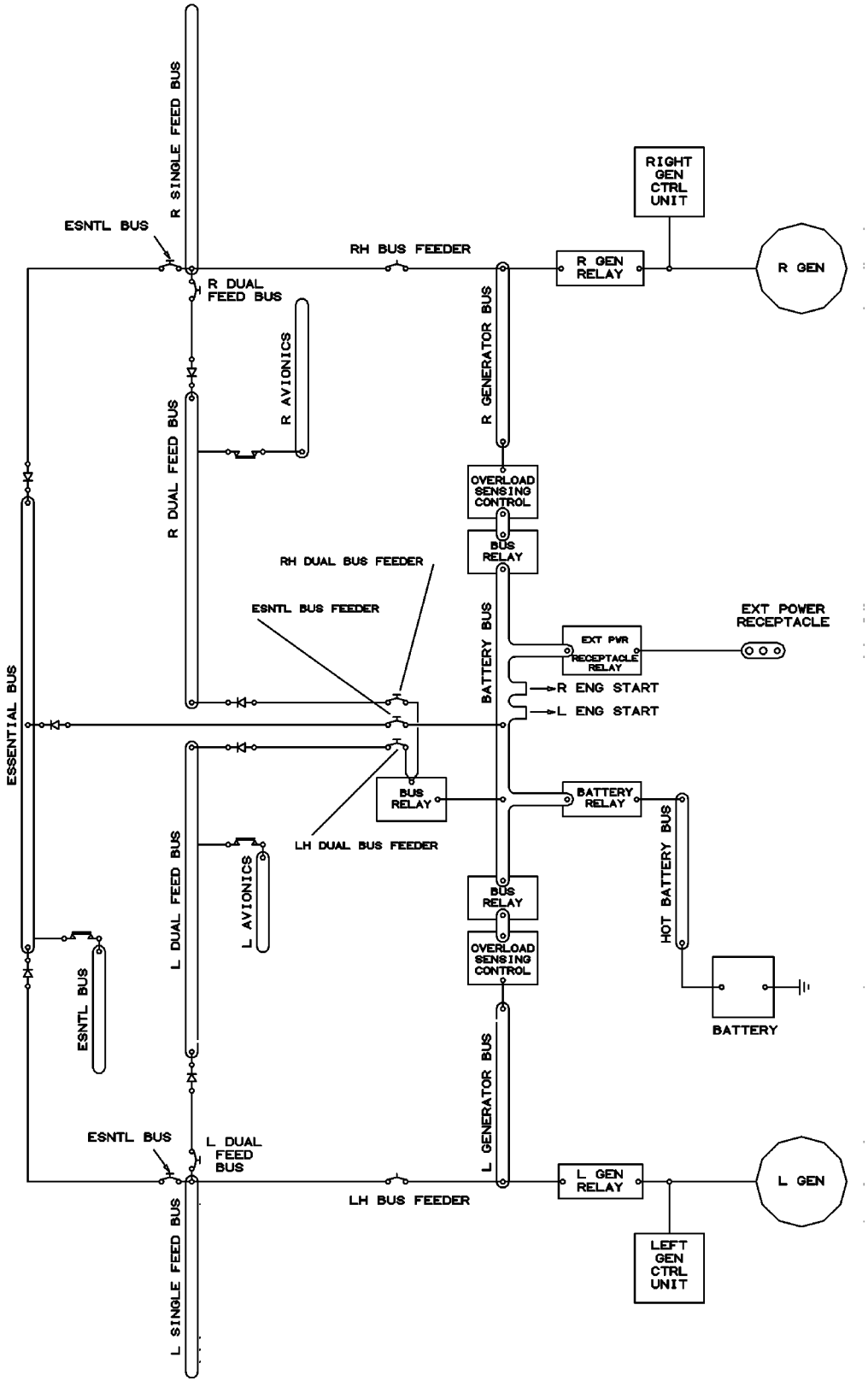
Figure 7-15. ELECTRICAL SYSTEM MASTER SWITCHES



FM_7_16

Figure 7-16. POWER DISTRIBUTION DIAGRAM

L SINGLE FEED BUS
PRI WSHLD CONT
LIGHTS DIMMER
L MAIN FUEL PUMP
POS LIGHTS
ROLL TRIM
YAW TRIM
L FWD WING HEATER
CKPT BLOWER
SOV FLOOR DIFF
L LDG LT
STBY HORIZON (OPTIONAL)

R SINGLE FEED BUS
ANTI SKID (OPTIONAL)
READING LIGHTS
FLOOR LIGHTS
PAS ADVSY LIGHTS
L OIL COOLER
R FWD WING HEATER
SEC WHSLD CONT
FIRE DETECTOR TEST
AIR CONDITIONING
TRIM POSITION IND
ANTICOLLISION LTS/ GROUND BEACON
R LDG LT
CLOCK
WING INSPECT LIGHT
R MAIN FUEL PUMP
SEC INVERTER
REC LIGHT

L DUAL FEED BUS
A.O.A. HEATER
LTS DOOR ACTR
L FUEL QUANTITY
L FUEL FIREWALL SOV
L ENG ICE VANE
TAXI LIGHT
L BLEED AIR
L WING HEATER
L TORQUE
L TURB RPM
L PROPELLER RPM
L OIL PRESS
L OIL TEMP
L FUEL FLOW/PRESS/ FILTER
PRI PITCH TRIM
L TURB TEMP

R DUAL FEED BUS
AVIONICS FAN NOSE
BOOTS DE-ICER
R WING HEATER
R FUEL FIREWALL SOV
R ENG ICE VANE
R OIL COOLER
R BLEED AIR
R PITOT/STATIC HEATER
R TORQUE
R TURB RPM
R PROPERLLER RPM
R OIL PRESS
R OIL TEMP
R FUEL FLOW/PRESS/ FILTER
CABIN PRESS
R FUEL QUANTITY
AUTOFEATHER
R TURB TEMP
PROP SYNCPH (OPTIONAL)
CHIP DETECTOR (OPTIONAL)

L AVIONICS BUS
PRE/VSI
HSI 1
MPU L
MFD
RMI 1
DME 1

BATTERY BUS
PRI PITCH TRIM POWER
R ENG START
L ENG START
R STBY FUEL PUMP
L STBY FUEL PUMP

L GENERATOR BUS
PILOT WSHLD ZONE 2 ANTI-ICE
UTILITY
L FWD WING ANTI-ICE
PILOT WSHLD ZONE 5 DEFOG
FLAPS
L GEN CONTROL

R GENERATOR BUS
R GEN CONTROL
PILOT WSHLD ZONE 6 DEFOG
R FWD WING ANTI-ICE
HYDRAULIC PUMP MOTOR
PILOT WSHLD ZONE 1 ANTI-ICE

ESSENTIAL BUS
MASTER AVIONICS
COMM 1
AUDIO 1 (PIL)
R OVERLOAD SENSOR
L OVERLOAD SENSOR
R ENG START
L ENG START
IGNITION SYSTEM
BUS DISCONNECT
R DC GEN RESET
L DC GEN RESET
HYDR WARNING/PRESS
FLOOD LIGHTS
FUEL CROSSFEED
MFDI
WING OVHT
L PITOT/STATIC HEATER
OXY VALVE
LDG GEAR CONTROL
NOSE STEERING
STALL WARNING
PRI INVERTER
WARNING SYS LIGHTS
SEC PITCH TRIM
BAT TEMP (MFDI)
AURAL WRN
ICE DETECTOR
LDG GEAR POS LTS
TURN/SLIP IND

ESSENTIAL AVIONICS BUS
DPU 1
ADI 1
DSP 1
ADC/ALI
MSI/ADC
NAV 1 PWR
XPNDR 1
COMPASS 1 PWR

R AVIONICS BUS
ADF 2 (OPTIONAL)
DME 2 (OPTIONAL)
SENSOR (LRN) (OPTIONAL)
CDU (LRN) (OPTIONAL)
PWR (LRN) (OPTIONAL)
DSP (OPTIONAL)
DPU (OPTIONAL)
HSI (OPTIONAL)
ADI (OPTIONAL)
COMM 2
NAV 2 PWR
XPNDR 2
ADF 1
RMI 2
RADIO ALTM
AUDIO 2 (COPIL)
ALTM
MPU R
AUTOPILOT
AIR DATA SENSOR
AP SERVOS
HSI 2
COMPASS 2 PWR
RDR METEO

HOT BATTERY BUS
R FUEL FIREWALL SOV
BATTERY RELAY
L FUEL FIREWALL SOV
HYDR LEVEL/FILTER/ ENG OIL (GRND TEST PANEL)
REFUEL
ENTRY/BAGGAGE LIGHT
R FIRE EXT (OPTIONAL)
L FIRE EXT (OPTIONAL)

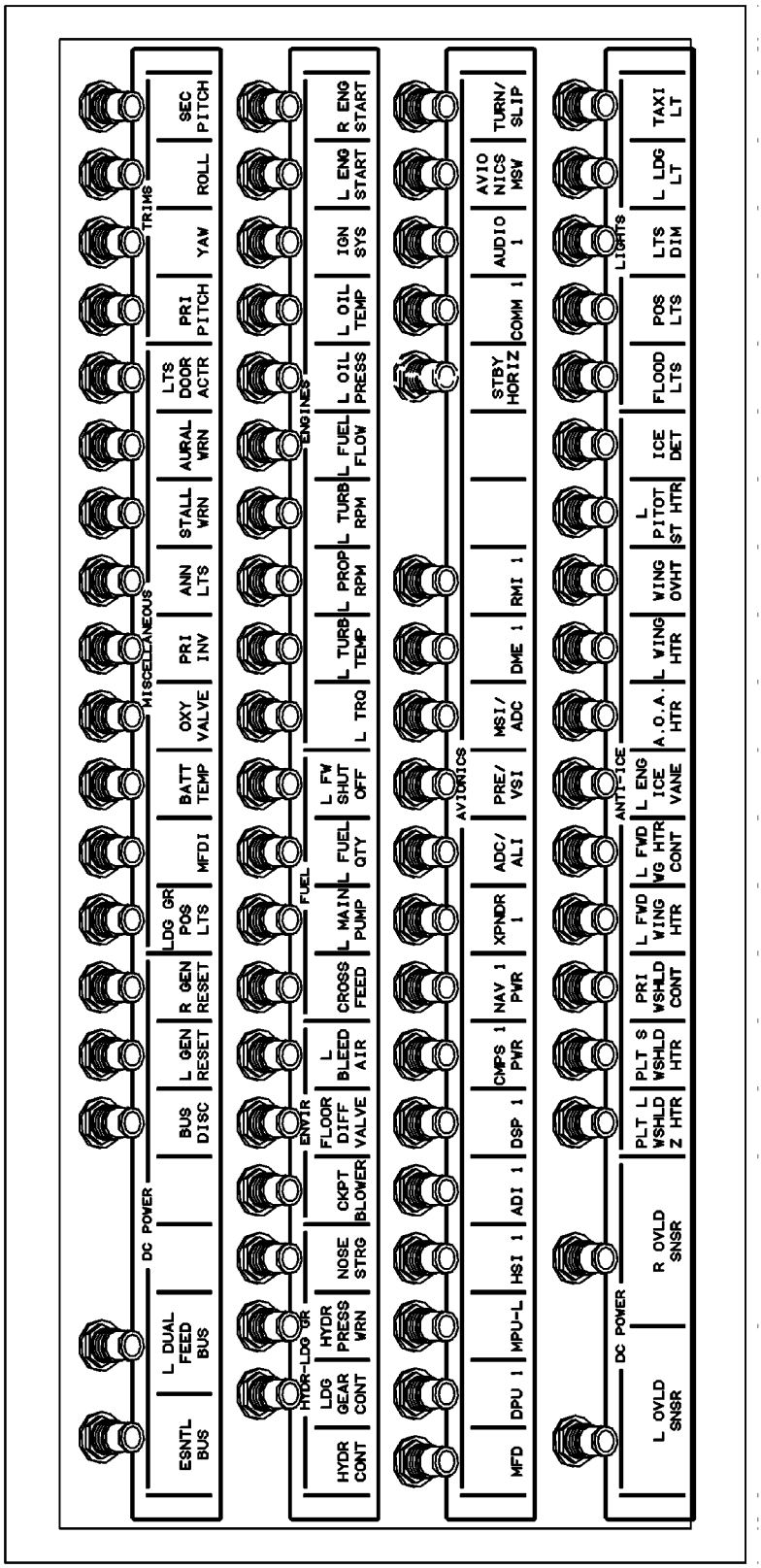


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Figure 7-17. LEFT CIRCUIT BREAKER PANEL

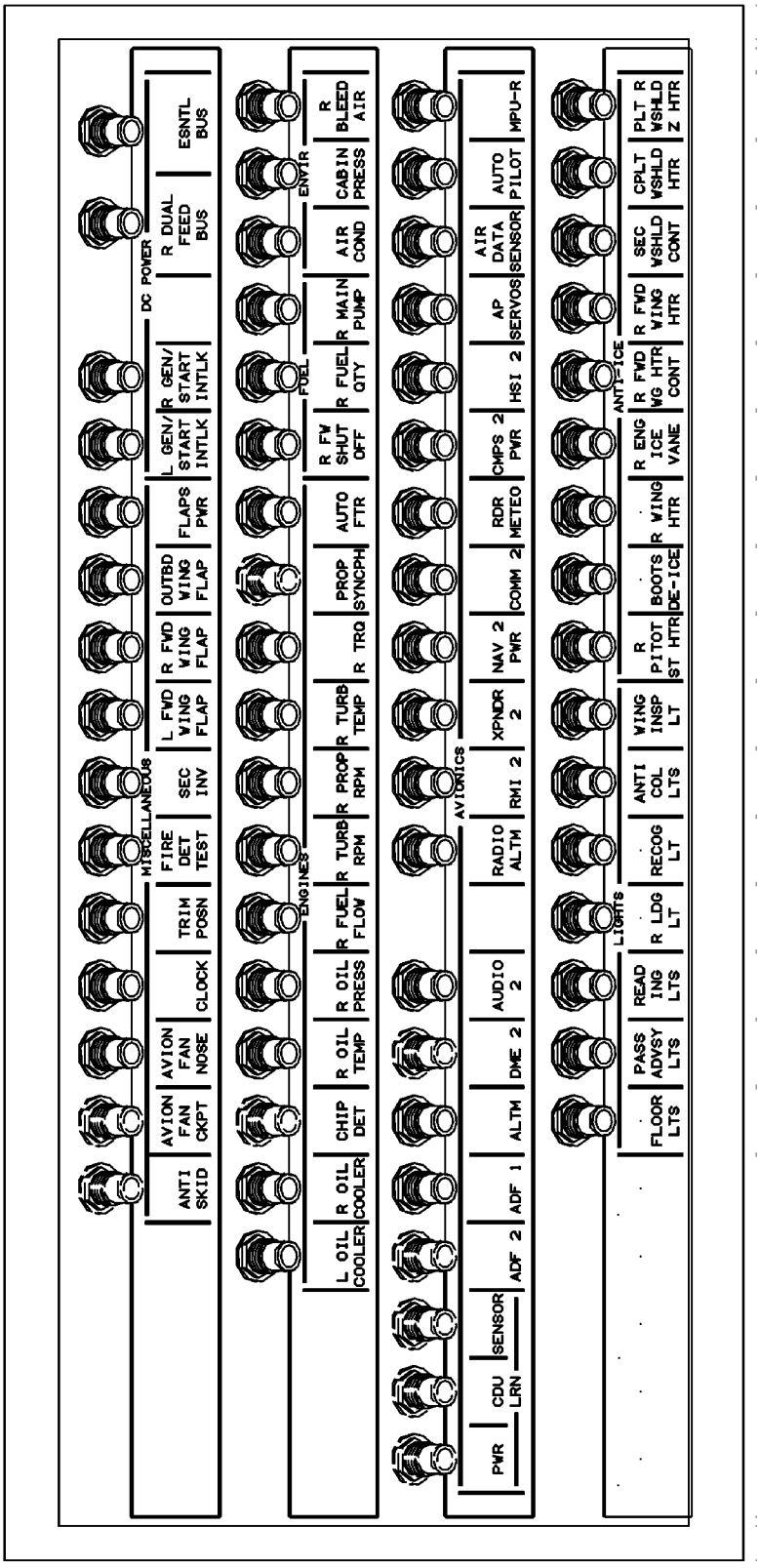

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Figure 7-18. RIGHT CIRCUIT BREAKER PANEL

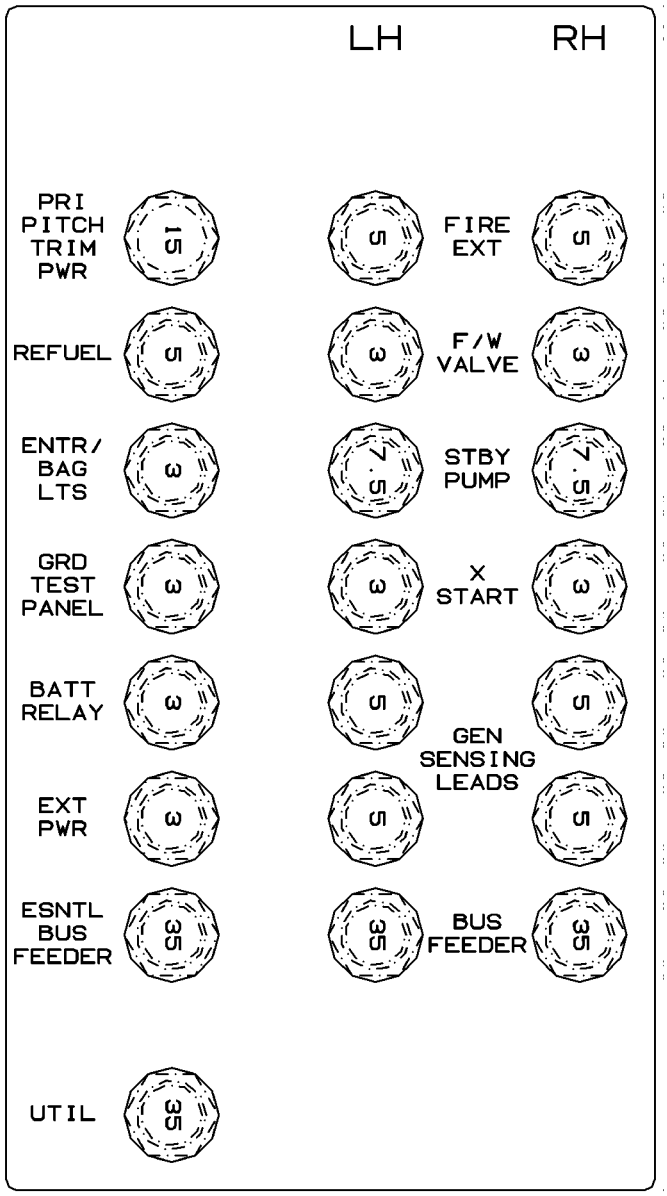

Figure 7-19. MAIN JUNCTION BOX CIRCUIT BREAKER PANEL

NOTE

This circuit breaker panel is located in the baggage compartment and cannot be reached during flight.

The cross start system provides generator power to assist the battery in starting the second engine. A generator assisted start is accomplished by engaging the operative engine generator. The inoperative engine will receive power from both the battery and the running generator when the start switch of the engine to be started is moved to the START position.

Resetting a generator after it has been de-energized by its own control unit requires that the corresponding GENERATOR switch is pushed to the momentary RESET position and then raised to the L (or R) position. The resetting circuit of each generator is protected by the corresponding L or R GEN RESET 3-ampere circuit breaker on the pilot circuit breaker panel. The L GEN and R GEN amber caution lights on the annunciator display come on when the corresponding generator is either disengaged or failed.

The L and R GEN/START INTLK remote control circuit breakers, located on the copilot circuit breaker panel, protect the output line from each generator and the corresponding control unit.

Each starter/generator control unit performs the following operating functions:

- output voltage regulation
- generators paralleling (load division control)
- overvoltage protection
- overexcitation protection
- reverse current protection
- automatic start cycle control

The battery is permanently connected on the hot battery bus while it can be connected on the bus system only by setting to the BAT position the battery switch. A temperature probe installed on the battery allows monitoring the battery temperature that will be displayed on the multi function display indicator after selecting the BAT TEMP position. In addition a BAT TEMP amber caution light and BAT OVHT red warning light are provided on the annunciator display to alert the pilot: the BAT TEMP light will come on when the battery temperature reaches 120 °F (battery warm), while the BAT OVHT light will come on when the battery temperature reaches 150 °F (battery overheat).
Engine battery starts must be avoided if the battery is warm (above 120 °F) in order to prevent a possible battery destruction. In this condition secure ground power unit assist.
When a battery start or heavy charging is in progress the battery temperature will increase. The BAT TEMP light may come on, but this is not a warning, just a caution. If the BAT OVHT light (150 °F) comes on isolate the battery as soon as possible and allow to cool, but continue to monitor the temperature.

NOTE

If the battery temperature reaches 150 °F, either during start or in flight, the battery must be turned off and removed for bench test inspection prior to the next flight.

After engines are started and generators are running, note the battery temperature. If the temperature has risen to 140 °F or above do not take off until the temperature has decreased to 120 °F and descending. After the takeoff observe that the temperature continues to drop: the BAT TEMP and the BAT OVHT lights should be off.
Subsequent to the takeoff and the flight if the BAT TEMP comes back on and the temperature is in the caution range, the crew should monitor the trend. If the temperature continues to rise, disconnect the battery at 140 °F and run on the generators.

If the temperature continues to rise after disconnection land the airplane as soon as practical. If running on generators only, when approaching terminal area, if the battery has cooled below 120 °F, place it on the bus to land in order to prevent total power loss during engine idling. If the BAT TEMP light comes back on turn the battery off, exercise caution, and notify tower of the problem before landing.
The battery temperature monitoring system is fed by the essential bus through the 3-ampere BAT TEMP circuit breaker located on the pilot circuit breaker panel.

The external power socket connects on the bus system through a relay that actuates the connection only if the external power source is properly plugged in (correct polarity) and the battery is on (battery switch in BAT position). The specially shaped external power socket prevents the connection with inverted polarity. While the external power source is connected the EXT PWR green advisory light in the center display panel is turned on.

NOTE

The external power source used for starting engines should have a peak capacity of at least 1200 Amps at 28 Volts D.C. and a maximum continuous capacity of 400 Amps.

An optional overvoltage protection (Kit P/N 80KA00038-801) can be installed on the airplane external power supply line. When installed, the protection function provides the airplane D.C. system automatic disconnect from the ground power unit should an overvoltage condition occur. The ground power unit operation is automatically recovered as soon as the voltage goes down to the normal range.

D.C. electrical power supply is divided into separate busses in order to provide for safety and redundancy in the electrical distribution system.
Nine primary feed busses are provided:

- one essential triple feed bus
- two dual feed busses (left and right)
- two single feed busses (left and right)
- two generator busses (left and right)
- one battery bus
- one hot battery bus

The essential bus is fed from the battery and both generators. The left and right feeding line are individually protected by a reverse current diode and a circuit breaker, whilst the center feeding line (from the battery bus) is protected by a reverse current diode and the 35-ampere ESNTL BUS FEEDER circuit breaker located in the main junction box circuit breaker panel. The ESNTL BUS 25 Amp. circuit breakers from the generators are located on the pilot and the copilot circuit breaker panels. The system ensures the essential bus operation also in the event of independent failures on two of the three feeding lines.

The dual feed busses are fed from the battery and from the corresponding side generator. Each feeding line is protected by a reverse current diode and the 35-ampere LH and RH DUAL BUS FEEDER circuit breaker located in the main junction box circuit breaker panel. The L and R DUAL FEED BUS 35 Amp. circuit breakers from the generators are located on the pilot and the copilot circuit breaker panel respectively. The dual feed busses fail to supply the related loads when failures occur on both feeding sources.

The single feed busses are fed from the corresponding side generator through individual 90 Amp. circuit breakers located in the main junction box.

The generator busses, the battery bus and the hot battery bus have no special protection due to the reduced size and the very close position of the feeding source.

To ensure safe flight operations the electrical loads are assigned to the various busses according to their functions.
D.C. electrical power to the avionics equipment is supplied through three auxiliary busses:

– the essential avionics bus, fed from the essential bus
– the left avionics bus, fed from the left dual feed bus
– the right avionics bus, fed from the right dual feed bus

During normal operations all the busses are interconnected acting as a single bus system with power being supplied from the battery and both the generators. When a failure occurs, the affected bus disconnects from the related feeding sources and from the other busses in order to prevent more serious damages.
When either one or both generators are properly operating and the bus switch is in the NORM position all the busses are interconnected. In the event of both generators failure the three bus-interconnecting relays automatically open disconnecting the busses while the BUS DISC amber caution light on the center display panel comes on. The essential bus only remains powered by the battery (as well as the battery bus and the hot battery bus), feeding all the loads essential for the flight in emergency condition. The pilot can re-connect the dual feed busses to the battery, if necessary, by setting the bus switch to the EMER position.

WARNING

In this condition, in order to avoid a too rapid discharge of the battery, disengage all equipment not strictly required by acting on the respective control switch or circuit breaker.

When the bus switch is set to the BUS DISC position the three bus-interconnecting relays open separating the busses and allowing the pilot to investigate for localizing failures.

Two thermal overload sensing controls are provided at the generators busses connections on the battery bus. If an overcurrent occurs, the overload sensing controls actuate the three bus-interconnecting relays that open separating the busses: the BUS DISC caution light comes on and the BUS DISC 3-ampere circuit breaker on the pilot circuit breaker panel trips out.

The electrical system is monitored through the Multi Function Display Indicator (MFDI) located on the pilot instrument panel. The display selector allows displaying the desired function when rotated to the related position:

– the output current of each generator (L and R GEN positions)
– the system voltage at the essential bus (BUS VOLTS position)
– the battery temperature (BAT TEMP position).

In the event the measured currents are above the maximum allowed value of 420 amps the WARN reading will appear on the display, alternatively to the displayed function and independently from the display selector position.

An additional Emergency Power Bus (EPB) is installed as a basic equipment on S.N. 1058 and up airplanes and as an optional equipment up to S.N. 1057 airplanes.
During normal operations the EPB is fed by the Left Single Feed Bus through the 5 ampere EPU circuit breaker on the Pilot's C/B Panel.
In the event of both generators failure the EPB is powered by the Emergency Power Unit, to assure the emergency power supply, for about 30 minutes, to the Standby Horizon and to an additional optional equipment requiring a +24Vdc back-up power. For airplanes equipped with the RVSM provision hardware the additional equipment is represented by the Air Data Display Unit (refer to Section 9, Supplement 27).

At customer option, suitable auxiliary D.C. electrical power sockets can be installed flush-mounted on the cabin floor and concealed under protection covers. Such electrical power provisions allow feeding of specific 24 Vdc role equipments to be arranged in the cabin.
The optional cabin auxiliary power sockets connect to the feeding bus through adequate (depending on the equipment loads) remotely controlled circuit breakers installed in the main junction box. The related control circuit breakers, located on the copilot circuit breaker panel, are placarded AUX# in numerical sequence.

NOTE

The use of the auxiliary cabin power sockets is subject to the manufacturer approval with reference to electrical loads, kind of operations, and compatibility of the connected equipment.

Furthermore, two optional power sockets, used to feed 12Vdc loads, can be installed, at customer option, on the left and right sidewalls of the cabin. The two sockets are powered by a 14Vdc Auxiliary Power System consisting in a DC/DC Converter, installed inside the cabin baggage compartment, fed by the Left Generator Bus through the 5 ampere AUX PWR circuit breaker installed on the Utility C/B Panel.

7.16.1 A.C. ELECTRICAL POWER

The A.C. electrical power required for avionics equipment is provided by two 250 volt-ampere static inverters located in the nose compartment. The power output from both the inverters is controlled by a unique control unit that connects each inverter to a proper 26 VAC bus and a proper 115 VAC bus. The power is delivered from the busses to the using systems through fuses located inside the inverter control unit. The loads are divided between the two inverters as per their function: one inverter, the primary one, feeds the most important (for the flight safety) loads, while the other one, the secondary, feeds the remaining loads. The two-position INVERTERS control switches, marked PRI-OFF and SEC-OFF respectively, are located in the MASTER SWITCHES panel on the pilot instrument panel. The primary inverter is fed from the essential bus through the PRI INV 15-ampere circuit breaker on the pilot circuit breaker panel. The secondary inverter is fed from the right single feed bus through the SEC INV 15-ampere circuit breaker on the copilot circuit breaker panel.

In the event of the primary inverter failure the control unit automatically connects the primary inverters loads on the secondary inverter while the secondary inverter loads remain disconnected. In the event of the secondary inverter failure the related loads are lost.

The inverters control unit drives the PRI INV and the SEC INV amber caution lights on the annunciator display. Each caution light comes on if the corresponding inverter is either failed or disconnected.

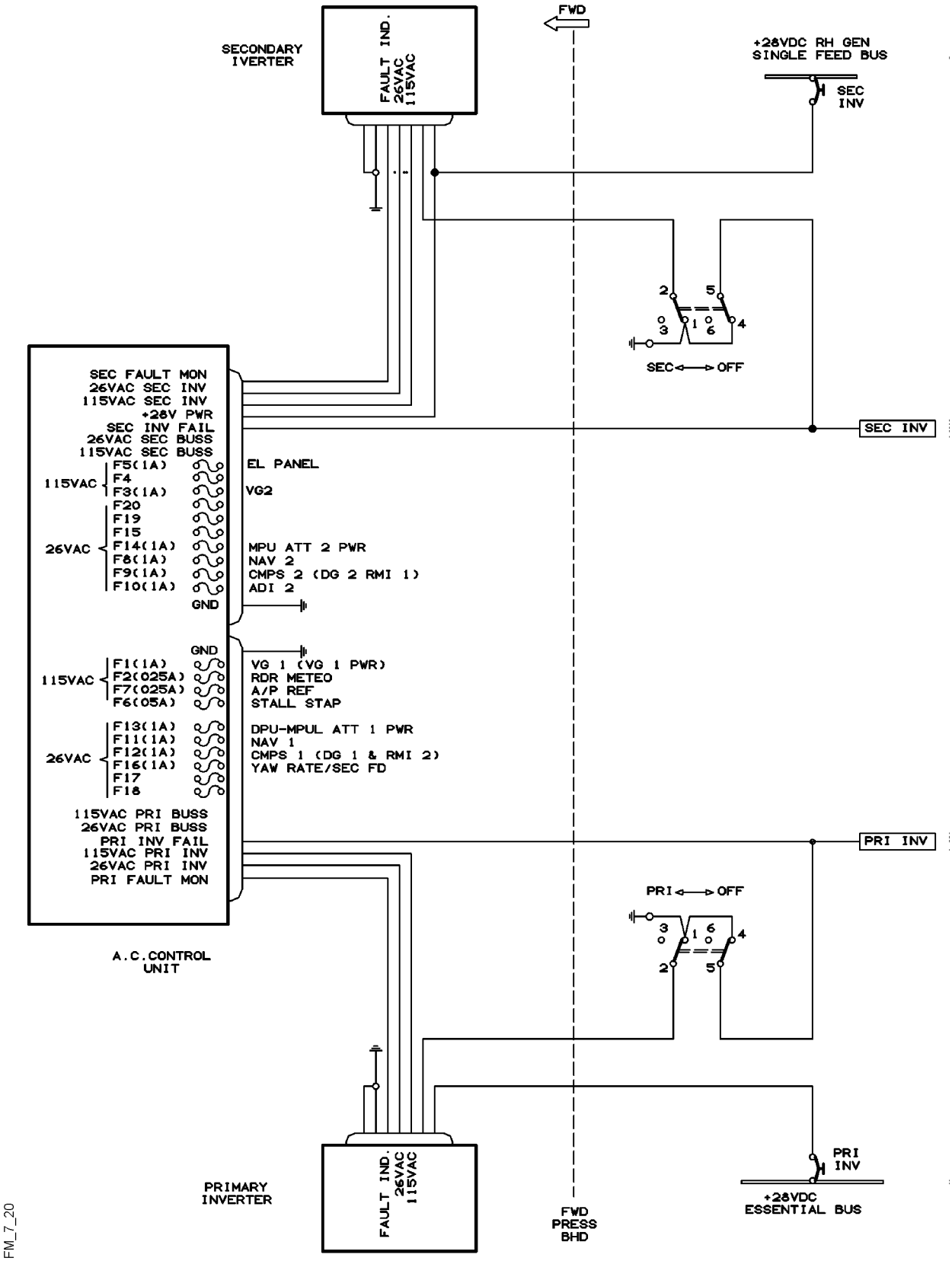

Figure 7-20. A.C. POWER DISTRIBUTION DIAGRAM

7.17 LIGHTING SYSTEM

The lighting system consits of external and internal lights.

The external lighting system includes:

- position lights
- anticollision lights
- ground beacon light
- landing lights
- taxi light
- recognition light
- wing inspection light

The control switches for operating the external lights are located in the LIGHTS panel on the pilot instrument panel.

Two forward (left red, right green) and two rearward (white) position lights are located on the main wing tips. Electrical power to the position lights is delivered by the left single feed bus through the POS LTS 5-ampere circuit breaker on the pilot circuit breaker panel and through the two position POS-OFF control switch.

Two anticollision strobe lights and one ground beacon strobe light are provided: the first anticollision light is located on the vertical fin upper fairing, the second one on the bottom fuselage, and the ground beacon on the top fuselage. The anticollision strobe lights are fed by individual power supply units while the ground beacon light is connected to a flasher unit. Electrical power to both the anticollision lights and to the ground beacon light is delivered by the right single feed bus through the ANTI COL LTS 5-ampere circuit breaker on the copilot circuit breaker panel. The anticollision and the ground beacon lights are controlled through the three position ANTI COLN AIR-GND-OFF control switch: when set to the AIR position the switch actuates the anticollision lights, while when set to the GND position actuates the ground beacon light.

Two landing and one taxi fully retractable lights are installed on a movable door located on the fuselage belly just forward the nose landing gear well.

WARNING

Do not operate the landing/taxi light switch at speeds above 160 KIAS.

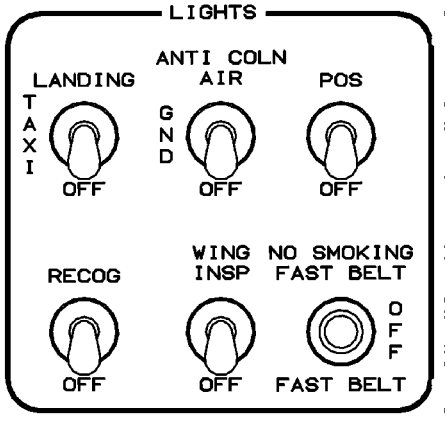

Figure 7-21. EXTERNAL LIGHTS CONTROL PANEL

The three position LANDING-TAXI-OFF control switch energizes the lights door actuator when moved to either the LANDING or the TAXI position. As the lights door opens extending the landing and the taxi lights, the LTS DOOR OPEN green advisory light on the annunciator display comes on and remains on until the door is open. When the lights door is completely extended a limit switch actuates the landing lights or the taxi light through individual relays as per the selected LANDING or TAXI position of the control switch. While the lights are extended any selection from the landing to the taxi or viceversa can be operated.
Setting the control switch to OFF, the actuator starts moving the lights door to closed, the door limit switch causes the lights relays to disengage and the related lights go off. As the door reaches the closed position the LTS DOOR OPEN green advisory light goes off.

Electrical power is delivered:

- to the left landing light by the left single feed bus through the L LDG LT 20-ampere circuit breaker on the pilot circuit breaker panel.
- to the right landing light by the right single feed bus through the R LDG LT 20-ampere circuit breaker on the copilot circuit breaker panel.
- to the taxi light by the left dual feed bus through the TAXI LT 15-ampere circuit breaker on the pilot circuit breaker panel.
- to the lights door actuator by the left dual feed bus through the LTS DOOR ACTR 3-ampere circuit breaker on the pilot circuit breaker panel.

NOTE

Electrical power delivery from the left dual feed bus to the taxi light and to the lights door actuator allows using the taxi light for landing in the event of failure on the single feed busses.

One recognition light is installed at the top of the vertical fin leading edge. Electrical power to the recognition light is delivered by the right single feed bus through the RECOG LT 5-ampere circuit breaker on the copilot circuit breaker panel and through the two position RECOG-OFF control switch.

One wing inspection light is installed outboard of the left engine nacelle. The inspection light allows observing the icing condition on the wing leading edge during night operations. Electrical power to the inspection light is delivered from the right single feed bus through the WING INSP LT 3-ampere circuit breaker on the copilot circuit breaker panel and through the two position WING INSP-OFF control switch.

The LIGHTS DIMMING CONTROL panel on the left side of the cockpit allows controlling and dimming the lights through four rotating knobs:

- The instrument panel glareshield flood lights through the FLOOD knob. The power is delivered by the essential bus through the FLOOD LTS 3-ampere circuit breaker on the pilot circuit breaker panel.
- All of the electroluminescent panels lights through the EL PANELS knob. The A.C. power is delivered by the secondary inverter through a fuse.
- The instruments and selection panels lights through the INSTR knob. The power is delivered from the left single feed bus through the LTS DIM 7.5-ampere circuit breaker on the pilot circuit breaker panel.
- The fuel and engine instruments digital display through the ENG INSTR DIG knob.

The ANN LTS two position switch on the LIGHTS DIMMING CONTROL panel allows dimming all of the warning, caution and advisory lights located on the instument panel, on the annunciator display, and the digital indication of the MFDI.

The two map lights are located on the left and the right side of the cockpit. Each map light is controlled by its own on/off switch with rheostat and is fed from the essential bus through the FLOOD LTS 3 Amp. circuit breaker on the pilot circuit breaker panel.
The two spot type crew lights are located on the left and the right side of the cockpit dome. These lights are fed by the hot battery bus through the 3 Amp. ENTR BAG LTS circuit breaker located on the main junction box circuit breaker panel in the baggage compartment and are controlled through the CREW membrane on/off switch located on the entry door switch panel or by the CKPT LTS switch on the LIGHTS DIMMING CONTROL panel.

The cabin illumination depends on the specific interior chosen: the following systems could apply in general.

- An entry light is located close to the cabin door frame. It is fed by the hot battery bus through the 3 Amp. ENTR/BAG LTS circuit breaker located on the main junction box circuit breaker panel and is controlled through the ENTRY membrane switch located on the entry door switch panel.
- Cabin lights are located laterally alongside the cabin dome in two rows.
  They are controlled by the CABIN membrane on/off/bright/dim switches located on the Entry Door Switch panel and by other switches located in other points (like, for instance, seat armrests).
  Electrical power is supplied by the interior bus, linked to the left generator bus, through the 35 Amp. UTIL circuit breaker located on the main junction box circuit breaker panel in the baggage compartment.
- Individual orientable spot type reading lights are located laterally alongside the cabin dome and are fed from the right single feed bus through the READING LTS 10 Amp. circuit breaker located on the copilot circuit breaker panel. Each light is controlled by its own READ LIGHT membrane on/off switch on the corresponding seat armrests.
- Spot type table lights are located in the cabin dome just above the retractable tables and they are operated from the TABLE LIGHT membrane switch on the corresponding seat arm rest. They are fed by the same bus and through the same circuit breaker as the reading lights.
- Vanity and indirect lights are located in the lavatory compartment. They are controlled by the VANITY and INDIRECT LIGHTS membrane switch on the lavatory switch panel.
  A light is provided inside the Coat closet compartment, and it is operated directly by the compartment door.
  All the lights are fed by the auxiliary interior bus, linked to the left generator bus through the 35 Amp. UTIL circuit breaker located on the main junction box circuit breaker panel in the baggage compartment.

The rear baggage compartment light is controlled by an on/off toggle switch located close to the compartment door frame. A microswitch actuated by the door allows turning on the light only if the door is open. The light is fed from the hot battery bus through the 3 Amp. ENTR/BAG LTS circuit breaker located on the main junction box circuit panel in the baggage compartment.

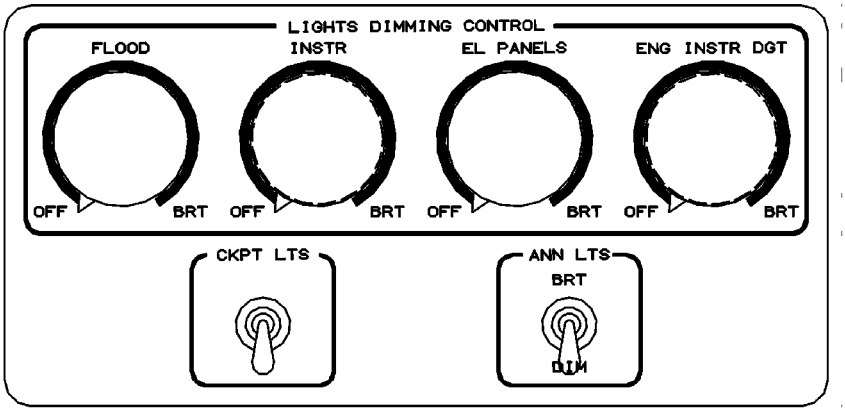

Figure 7-22. DIMMING CONTROLS

7.18 PRESSURIZATION SYSTEM

The cabin pressure control system (CPCS) is an electropneumatic system normally operated by a digital-electronic controller; a completely independent manual control is also provided.
The air necessary to pressurize the cabin is supplied by the environmental control system (ECS) or by the emergency pressurization system. Two valves control the cabin pressure, regulating the discharge of the air from the cabin to the outside.
The emergency circuit, consisting of a shutoff valve and of a bulkhead check valve, is fed by bleed air supplied by the engine through a check valve and a flow limiting venturi.
The bleed air is collected into a pressure manifold that provides air also for the CPCS ejector, for the pressurization of the hydraulic tank, for the operation of the main wing and engine ice protection systems and for the door sealing.
The door sealing consists of two separate chambers, one inside the other, independently fed by a pressure regulated air supply. Two pressure switches, one for each seal tube, control the DOOR SEAL amber caution light located on the annunciator panel. When the entrance door is secured and the seal is properly inflated the caution light goes off. If just one or both the seal tubes are not inflated the caution light remanins on.

When the emergency bleed air is required, the emergency poppet type solenoid driven shut-off valve is open and the air flows directly to the cabin through the bulkhead check valve.
This valve prevents reverse flow from the cabin in case of a rupture of the emergency pipe, downstream the shut-off valve.

The CPCS consists of a controller, a selector, a differential pressure switch, a manual controller, a vacuum regulator, two outflow control valves and an ejector, which furnishes a low pressure level to the primary safety/outflow valve.
The cabin pressure controller contains the electronic circuits and components to obtain an automatic pressure control, including continuous self test functions and normal positive pressure control.
The controller generates the electrical signal to operate the primary outflow valve: to sense the differential pressure two ports are provided, one open in the cabin and the other connected to the airplane static source.

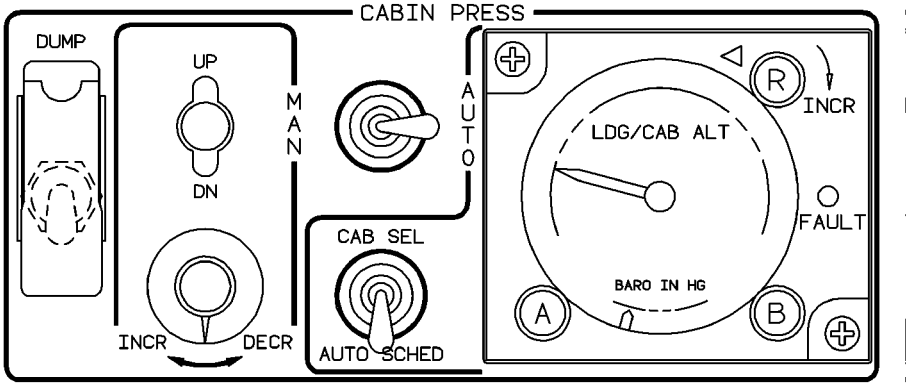

Figure 7-23. CABIN PRESSURIZATION CONTROLS

On the pressure selector panel it is possible to set the cabin rate of climb (knob R), the barometric correction (knob B) and the cabin altitude (knob A): a fault indication lamp is also provided.
The cabin Δp switch senses the difference between the cabin and the ambient pressure.
The primary outflow/safety valve has a normal operating setting at 9.0 ±0.1 psid and a maximum at 9.3 ±0.1 psid for the primary and at 9.6 ±0.1 psid for the safety value.
Both primary and secondary safety/outflow valves are equipped with an altitude limit control set to 13000 ±500 ft, a negative pressure relief and independent static ports connected to the ambient in a position that does not allow any ice accretion.
When the cabin altitude is higher than 9500 ft or the differential pressure exceeds 9.4 psid, the CAB PRESS red warning light illuminates on the annunciator display.
The secondary safety/outflow valve is connected to the manual controller, which allows the control of the cabin altitude and rate of climb when the manual mode is selected.
The system is provided with a cabin pressure dump device. The pressure shall rapidly decrease down to the altitude limiter set of 13000 ±500 ft.
The cabin pressurization system control switches and gauges are grouped in the CABIN PRESS panel located in the lower right portion of the instrument panel.
The system can be operated in automatic mode (switch to AUTO) or, as a back up, in manual mode (switch to MAN).

When the AUTO mode is selected, two additional modes of operation are possible: one is a fully automated control (AUTO SCHED) which utilizes a pre-programmed relationship between cabin and aircraft altitudes; the other is a crew selection dependent control (CAB SEL). The two modes can be accomplished at any time, either on the ground or during flight.
The action required to the crew when operating in AUTO SCHED are:

– select the pressure altitude of the destination airport using the knob A;
– select proper barometric correction before landing using the knob B;
– verify, on the cabin altitude gauge, that cabin is depressurized before landing.

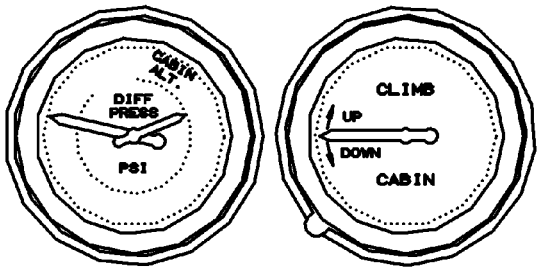

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Figure 7-24. CABIN DIFFERENTIAL PRESSURE AND ALTITUDE INDICATORS

When operating in CAB SEL mode the required operations are:

– select the cruise altitude as desired with the knob A;
– set the barometric correction with knob B to 29.92 in Hg;
– set the cabin rate of climb with knob R;
– re-select cruise altitude for flight plan variation;
– verify on the cabin altitude gauge that cabin is depressurized before landing.

At the discretion of the airplane operator or if an electrical failure has occured to the automatic controller, the cabin pressure control can be attained with the manual controller.
In this case the required actions by the crew are:

– place the mode switch to MAN;
– set the toggle switch to the detented UP or DN position to obtain respectively an increment or a reduction of cabin altitude as required to control the cabin pressure;
– regulate the rate of cabin climb with the knob as desired (rates from 50 to 3000 fpm are possible).

Electrical power for operating the system is delivered from the right dual feed bus through the CABIN PRESS 3-ampere circuit breaker on the copilot circuit breaker panel.

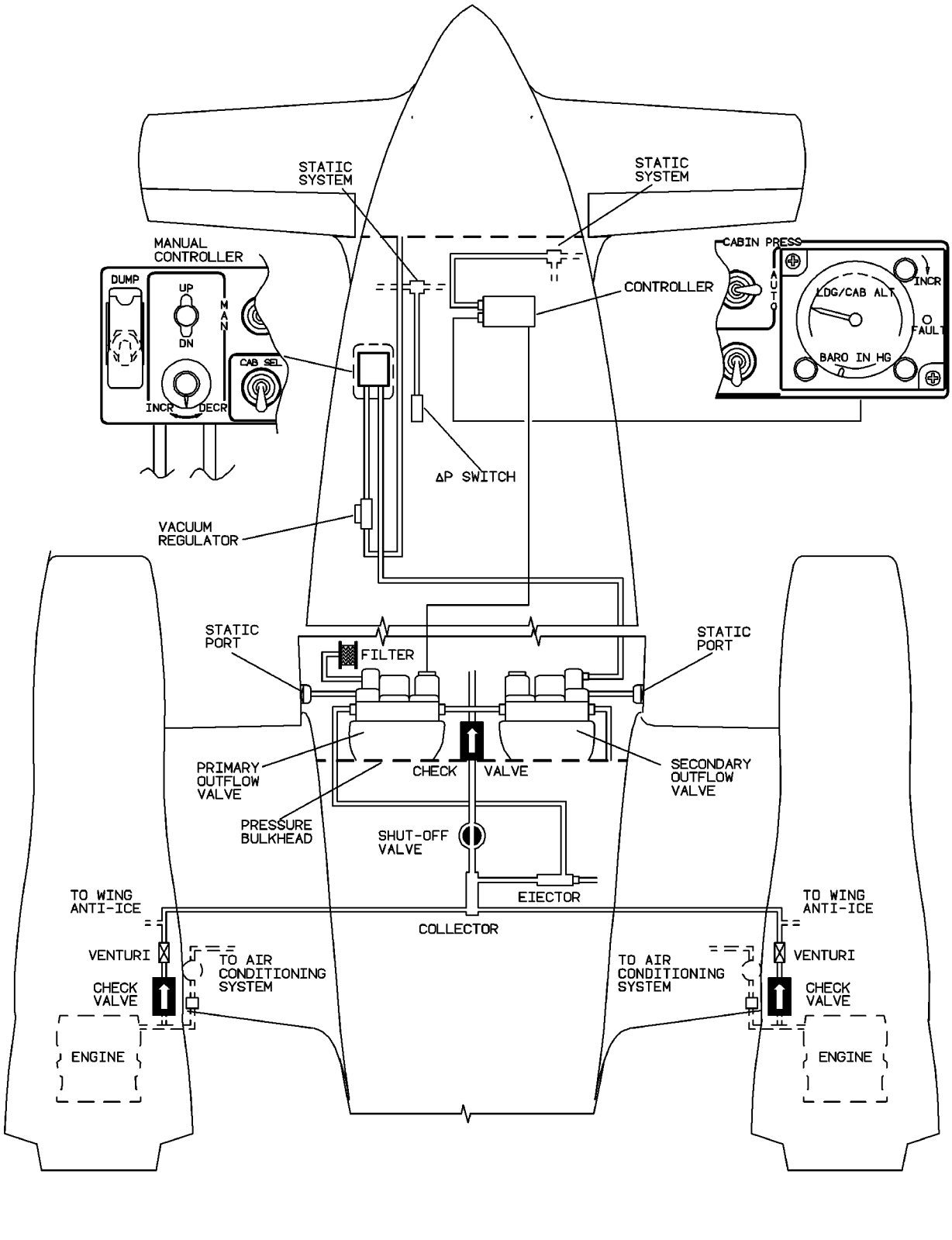

Figure 7-25. CABIN PRESSURIZATION SYSTEM

7.19 ENVIRONMENTAL CONTROL SYSTEM

Two different Environmental Control System (ECS) configurations are installed as follows:

AIRPLANES EQUIPPED WITH AIR CYCLE MACHINE

In this configuration the environmental control system utilizes engine bleed air for heating, cooling and pressurizing the cabin: one engine is capable to sustain the operation of the whole system.
The control of the environmental condition in the cabin is accomplished by the cabin pressure control system and by an air cycle machine.
A supplemental Freon Airconditioner can be installed at customer option for an additional cooled air supply as illustrated in the Supplement 9 at Section 9 of this POH.
The air flowing from the engine first enters a precooler, which reduces the temperature to an adequate level, then, through a shut-off, a check valve and a pressure regulator reaches the cooling unit.
Temperature sensors, fitted to the air ducts, detect a possible overheat or a rupture of the line and send an electrical signal to the L/R BLEED TEMP red warning lights on the annunciator display.

The environmental control system consists of a bootstrap three wheel air cycle refrigeration system, complete of water separator, warm air by-pass valve and temperature controls.
The airflow enters the primary section of the ram air heat exchanger and is partially cooled. Then the turbine-driven compressor boosts up the bleed air pressure and temperature; a second heat release is obtained when high pressure airflow passes through the secondary air heat exchanger and through the turbine.
A turbine-powered ram air fan provides airflow through the ram circuit. The conditioned airflow enters first the water separator and then is ducted to the cabin.
Depending upon the cabin temperature setting, warm air may by-pass the heat exchangers and the turbine, to mix with the cold air leaving the turbine.
The warm air by-pass valve is positioned by the temperature controller which receives inputs from the cabin temperature selector and the cabin temperature sensor. The by-pass valve also deices the water separator upon signal from the pack discharge temperature sensor, which prevents also the cabin supply air temperature from exceeding a preset maximum value.

A temperature sensor is fitted to the cabin air supply duct to switch on the DUCT TEMP red warning light if an overheat is detected.

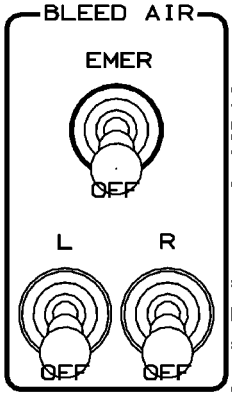

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Figure 7-26. ENGINE BLEED AIR CONTROLS

The cabin temperature control is an electronic unit which drives the by-pass valve to maintain the selected air temperature in the cabin, comparing sensed cabin temperature, rate of change of duct temperature and selected cabin temperature.

The environmental control unit and switches are located in the lower right side of the instrument panel, close to the pressurization panel.
The system can operate in automatic or in manual mode.
When the selector switch is set to AUTO, the cabin temperature is automatically maintained to the value selected by the rotating variable control knob.
When the switch is set to MAN position, the temperature control is achieved by a three position momentarily siwtch: the by-pass valve opens or closes respectively when the HEAT or COOL position are selected and stops when the switch is released in neutral position.

The air in the passenger area is distributed through overhead and floor diffusers; in the cockpit through adjustable outlets, lateral diffusers and floor diffusers.
A fan, operated by the CKPT BLOWER switch, allows to increase the airflow in the cockpit; the FLOOR AIR switch opens the shut-off valves, if installed, of the cabin floor diffusers.

Electrical power for operating the left, the right and the emergency bleed air valves is supplied by the left and right dual feed busses through the L BLEED AIR and the R BLEED AIR 3-ampere circuit breakers respectively on the pilot and the copilot circuit breaker panels.
Electrical power for shutting off the flapper of the pressure regulating valve is delivered from either the right single feed bus through the AIR COND 3-ampere circuit breaker on the copilot circuit breaker panel in the event of overtemperature, or the left and right dual feed busses through the L WING HEAT and R WING HEAT 3-ampere circuit breakers on the pilot and the copilot circuit breaker panels when the main wing anti-icing system is activated.
The floor air diffuser valves, if installed, are powered from the left single feed bus through the FLOOR DIFF VALVE 3-ampere circuit breaker on the pilot circuit breaker panel.
The individual adjustable air outlets are controlled through the AIR membrane momentary switches located on the seats armrests which allow continuous adjustment of the air flow. The power is delivered from the interiors bus through the CAB AIR 5-ampere circuit breaker.

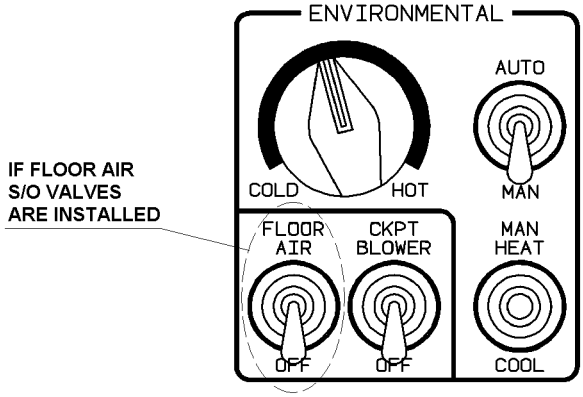

Figure 7-27. ENVIRONMENTAL SYSTEM CONTROLS

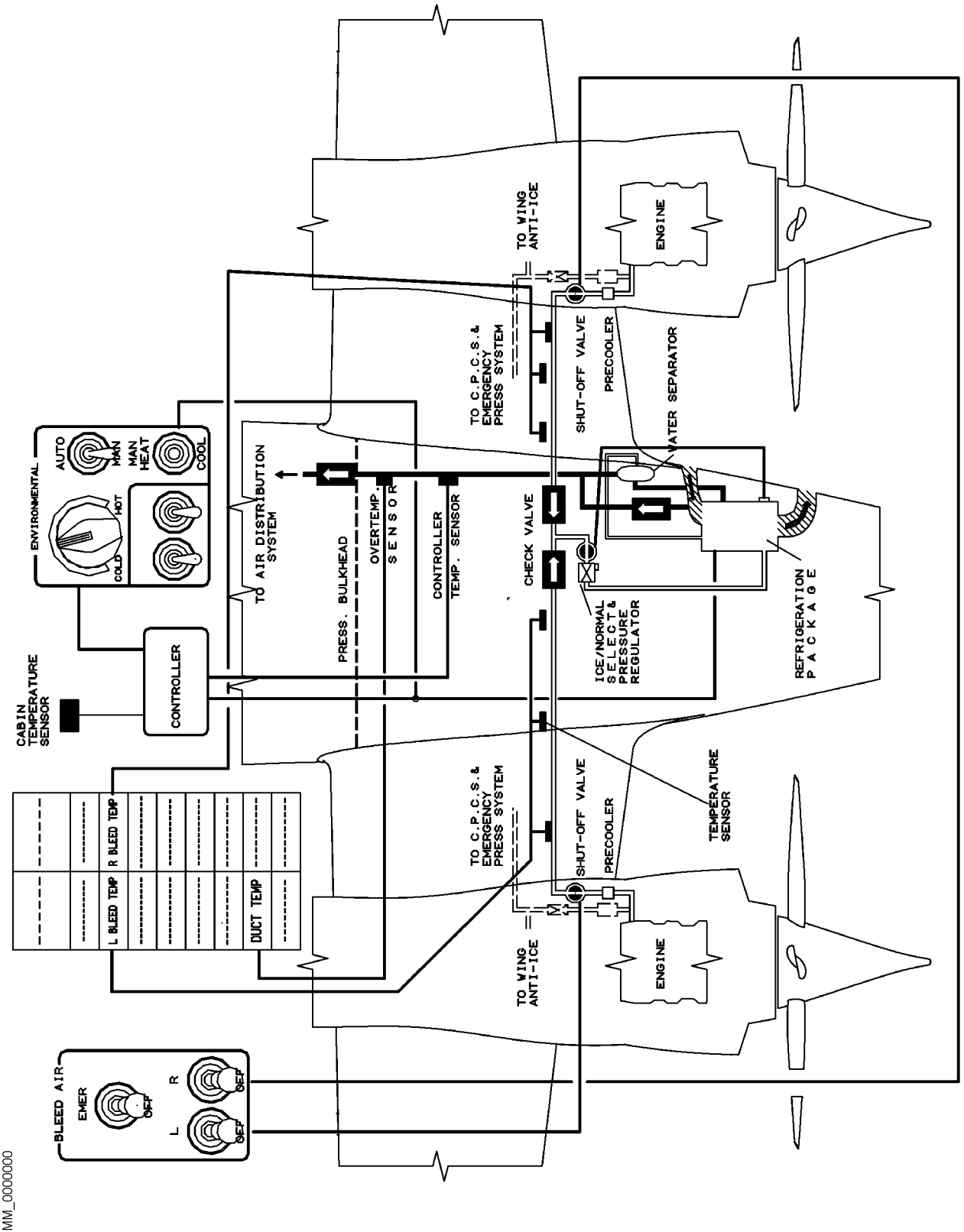

Figure 7-28. ENVIRONMENTAL SYSTEM

AIRPLANES EQUIPPED WITH HEATING UNIT/AIRCONDITIONER SYSTEM

In this configuration the environmental control system utilizes engine bleed air for cabin pressurization, through the pressure control, and for cabin heating, through an Heating Unit, while a Freon Airconditioner is installed as basic equipment for cabin cooling.
Depending on ambient temperature, combined operation of both the Heating Unit and the Freon Airconditioner can be required up to 20000 ft. in order to ensure comfortable cabin conditions.
Refer to Supplement 9 at Section 9 of this POH for Freon Airconditioner limitations, operational procedures and description.

One engine is capable to sustain the operation of the pressurization control and of the heating unit.
During single engine operations, the Freon Airconditioner is automatically disengaged due to the excessive electrical load.

The air flowing from the engine first enters a precooler, which reduces the temperature to an adequate level, then through a shut-off valve, a check valve and a pressure regulator reaches the heating control system.
Temperature sensors, fitted to the air ducts, detect a possible overheat or a rupture of the line and send electrical signals to the L/R BLEED TEMP red warning light on the annunciator display.

The heating control system permits an independent temperature control of the cabin and cockpit areas, and consists, essentially, of a Heat Exchanger, two Temperature Modulating valves, two Electronic Temperature Controllers, two duct temperature sensors, two overtemperature sensors and a Heating control panel.

The bleed air is divided into two flows; one enters the air-to-air Heat Exchanger to produce a colder flow; the other one by-passes the Heat Exchanger and it is then mixed to the colder flow through the two Temperature Modulating valves.
During flight operations the cooling air for the Heat Exchanger enters through an external air inlet placed on the right side of the rear fuselage and it is exhausted from an outlet located on the same side of the rear fuselage.
A vane axial blower, controlled by a weight switch on the left main landing gear leg, provides the airflow to the Heat Exchanger during ground operations only.

The two, cabin and cockpit, temperature modulating valves are located behind the rear pressure bulkhead, under the baggage compartment floor.
Downstream the temperature modulating valves the airflow is then ducted to the cabin and cockpit areas through suitable mufflers.

Two overtemperature sensors are fitted to the cabin and cockpit air supply ducts to switch on the DUCT TEMP red warning light if an overheat is detected.

The two, cabin and cockpit, Temperature Controllers are electronic units which, on the basis of the received inputs from the relevant area temperature sensor, duct sensor and the desired temperature from the Heating Control Panel, drive the position of the relevant temperature modulating valve, as necessary, to obtain adequate downstram temperature.

The Heating Control Panel is located in the lower right side of the instrument panel, close to the pressurization control panel and includes three concentric type rotary switches for a fully independent control of system operation in the cabin and in the cockpit area: the external knob of each switch is for the cockpit area while the inner knob is for the cabin area heating control.
The AUTO potentiometer switch allows setting of the desired temperature when in the system automatic mode of operation.
The AUTO/OFF/MAN mode selector switch allows selecting the system automatic (AUTO) or manual (MAN) mode of operation through the system inoperative (OFF) mode.

NOTE

When the OFF mode is selected the temperature modulating valve stops at the last operating position and allows the heating flow to continue.

The LO/MANUAL/HI manual control switch allows selecting the air inflow temperature when in manual mode of operation.

The system mode of operation, automatic or manual, can be selected independently for the cockpit and for the cabin.
After selecting the AUTO mode with the mode selector, the temperature of related area is automatically maintained to the level selected by means of the AUTO potentiometer switch.
When the MAN mode is selected on the mode selector, the temperature of the related area is controlled by discrete movings to the HI (high) or LO (low) springloaded position of the related manual control switch. Each manual control switch directly drive the corresponding temperature modulating valve: a complete and continuous motion of the valve from the full hot (HI) to the full cold (LO) position or viceversa requires about 15 seconds.

The air flow is distributed in the passenger area through overhead and floor diffusers,while in the cockpit area through adjustable outlets, lateral and floor diffusers.
A fan, operated by the CKPT BLOWER switch, allows to increase the airflow in the cockpit.
The FLOOR AIR switch allows opening of the shut-off valves, if installed, delivering the airflow to the cabin floor diffusers.

Electrical power for operating the left, the right and the emergency bleed air valves is supplied by the left and right dual feed busses through the L BLEED AIR and the R BLEED AIR 3-ampere circuit breakers respectively on the pilot and the copilot circuit breaker panels.
Electrical power for operating the pressure regulating valve is delivered from the left and right dual feed busses through the L WING ANTI-ICE and R WING ANTI-ICE 3-ampere circuit breakers on the pilot and the copilot circuit breaker panels when the main wing anti-icing system is activated.
The temperature controllers, sensors and valves are powered from the right single feed bus through the HEAT 5-ampere circuit breaker on the copilot circuit breaker panel.
The vane axial blower is powered from the left generator bus through the HTR FAN 25-ampere circuit breaker in the main junction box.
The cockpit blower is powered from the left single feed bus through CKPT BLOWER 5-ampere circuit breaker on the pilot circuit breaker panel.
The floor air diffuser valves, if installed, are powered from the left single feed bus through the FLOOR DIFF VALVE 3-ampere circuit breaker on the pilot circuit breaker panel.

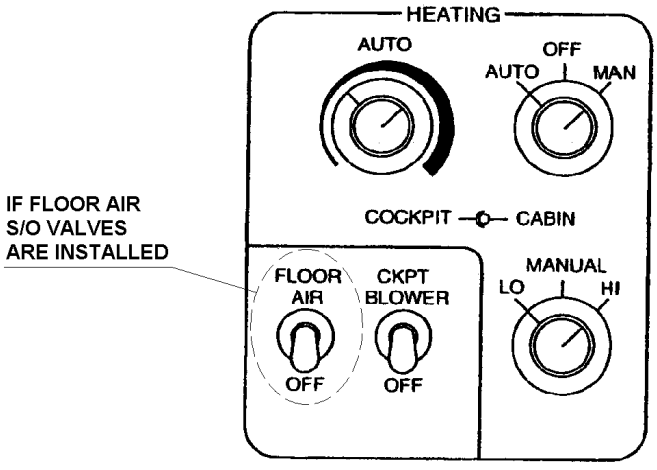

Figure 7-28/1. HEATING SYSTEM CONTROLS

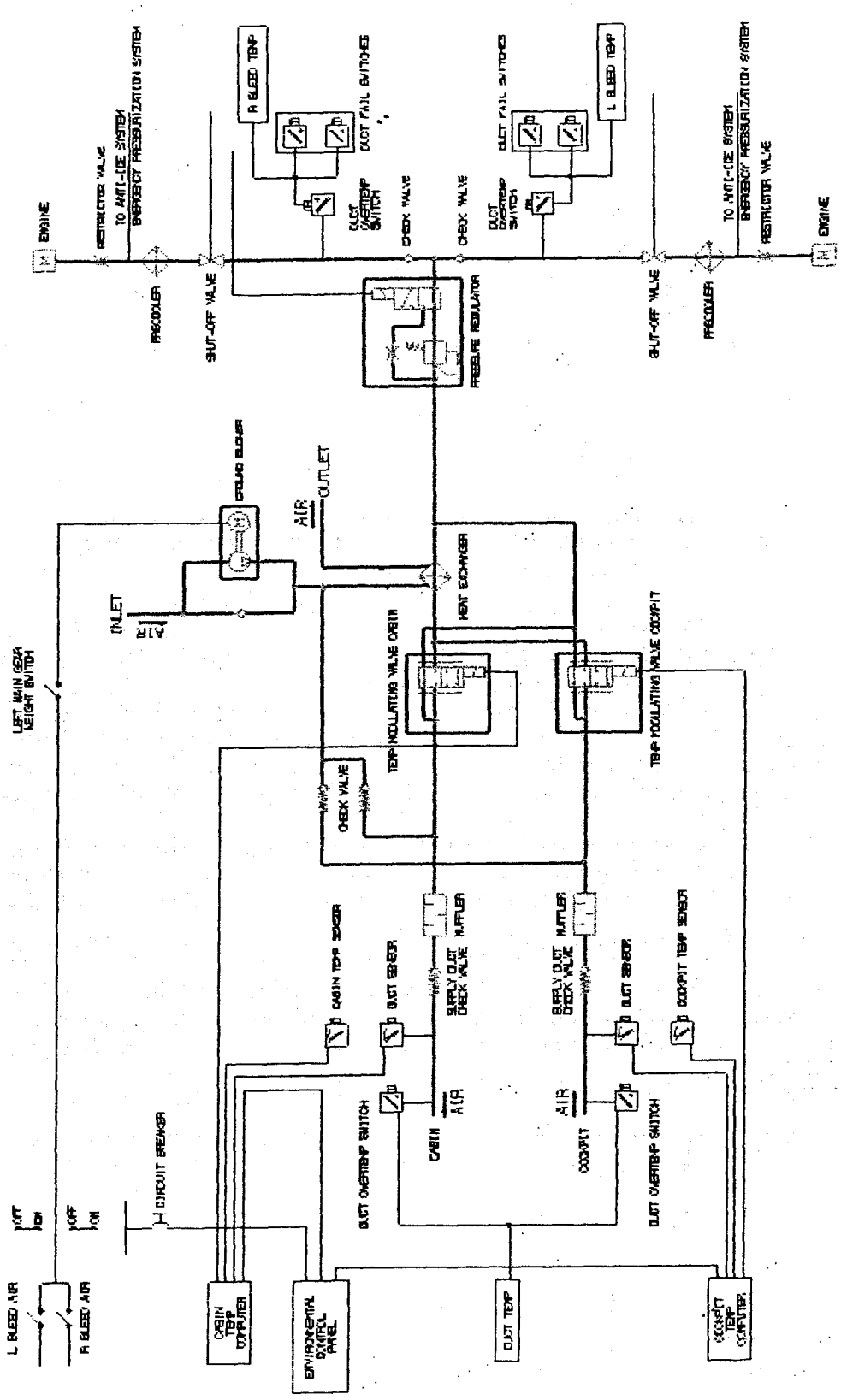

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Figure 7-28/2. HEATING SYSTEM

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7.20 OXYGEN SYSTEM

WARNING

Positively NO SMOKING while oxygen is being used by anyone in the airplane.

Keep the entire system free from oil and grease (to avoid the danger of spontaneous combustion), moisture (to prevent the equipment from freezing at low temperatures) and foreign matter (to prevent the contamination of the breating oxygen with dust odors and clogging of any mechanisms).

The airplane is equipped with an oxygen system that provides emergency supplementary oxygen for the crew and passengers in the event of pressurization failure or cabin air contamination.

The continuous flow system is monitored from the cockpit. Before taking off for flight at high altitude, ascertain that the oxygen supply is adequate for the proposed flight and that the passengers are briefed. The oxygen supply pressure gauge, mounted on the left side cockpit panel, displays to the pilot the storage cylinder pressure (1850 PSIG-full; 250 PSIG-empty at 70°F).

The 40 cubic foot storage cylinder is installed on the left side of the fuselage under the cabin floor aft of the cabin door. An on/off valve mounted directly on the cylinder is safetied in the "on" position, once the oxygen system is completely set up. The valve may be turned off when the system must be disconnected for maintenance. When "on", the on/off valve releases oxygen stored in the cylinder to a regulator valve which supplies a constant pressure to the crew masks outlets and to the passenger on/off valve and then to the passenger masks.

A pressure relief valve, which vents oxygen overboard in the event of a cylinder overpressure condition, is connected to an external port provided with a popout disc visible in green to the pilot during the preflight check. The overpressure discharge disk is located on the lower left side of the fuselage aft of the cabin door. If the disk is missing or ruptured, the oxygen cylinder is empty, and the cause should be determined: the cylinder must be removed and inspected. The regulator valve assembly incorporates a low pressure relief valve to bleed off excess delivery line pressure.

Oxygen is delivered to the pilot and copilot through outlets in the left and right side cockpit oxygen panels. Oxygen pressure from the storage cylinder regulator valve is directly available at crew masks outlets. The crew masks are quick-donning oral-nasal assemblies with mask-mounted diluter/demand regulators, flow indicators and microphones. The diluter/demand regulator features automatic air dilution, 100% oxygen manual control, and press-to-test capability. A stowage box for each crew mask is provided in the left and right side cockpit oxygen panels. The crew need only to don their masks to begin breathing oxygen.

Oxygen to the passengers is supplied through a manual or solenoid-operated (through a barometric switch) valve controlled by a three-position selector (PILOTS ONLY - AUTO NORMAL - MANUAL MASK RELEASE) located on the cockpit left side oxygen panel. A barometric switch, located on the cockpit right side oxygen panel, controls the valve solenoid operation at the presetted altitudes when in automatic mode. Oxygen is delivered to the passengers through lanyard operated, orifice regulated manifold valves. The masks are attached to the outlets and are stored in pairs in overhead, automatic deployment containers. The passenger masks will deploy automatically, dropping down in the cabin area, when the cabin altitude exceeds approximately 14,000 feet and the oxygen selector is set to the AUTO NORMAL position. The masks may also be manually deployed at any time by the pilot by placing the oxygen selector in the MANUAL MASK RELEASE position. Oxygen will not flow to the masks until the attached lanyard is pulled. This allows oxygen to flow from the manifold valves and orifices. The masks are oral-nasal type and are equipped with rebreather bags and flow indicators. The lanyard operated manifold valves are resettable. When the cabin altitude decreases below 12500 ft the flow to the passenger masks will automatically cease.

An oxygen filling valve is provided for storage cylinder charge. The filling valve is located on the cabin entrance door threshold, on the aft side, and is accessible only when the lower section of the door is open. Electrical power for operating the solenoid valve is delivered from the essential bus through the OXY VALVE 3-ampere circuit breaker on the pilot circuit breaker panel.

7.21 PITOT/STATIC SYSTEM

The pitot/static system supplies dynamic and static air pressure for the operation of the pilot and the copilot airspeed indicators. Static air is also supplied to the pilot encoding altimeter, the copilot altimeter, the pilot and the copilot vertical speed indicators.
At customer option the copilot standard altimeter can be replaced by a secondary encoding altimeter.

The pilot and copilot heated pitot tubes are located on the forward side of the fuselage under the forward wing.

Static ports are located on both the lower sides of the fuselage downward the second window of the cabin. Each static port is provided with two static source openings. There is a set of openings (one per each side) for the pilot's instruments and a set for the copilot's instruments. The dual pickups for both pilot's and copilot's instruments are provided to reduce side slip effects on the airspeed indicators, altimeters and vertical speed indicators.

A screw plug drains is provided at the lowest point in the system on the fuselage belly under the cockpit.

The anti-ice heating of the system is controlled through the PITOT/STATIC HTR switches, located in the ANTI-ICE panel on the pilot instrument panel: the left side pitot tube and static ports through the L & STALL switch, the power being supplied from the essential bus through the L PITOT ST HTR 10-ampere circuit breaker on the pilot circuit breaker panel; the right side pitot tube and static ports through the R switch, the power being supplied from the right dual feed bus through the R PITOT ST HTR 10-ampere circuit breaker on the copilot circuit breaker panel.

Pitot covers are provided with each pitot head and should be installed when the airplane is parked to prevent bugs and rain from entering the pitot head. A partially or completely blocked pitot system will give erratic or zero reading on the airspeed indicator.

NOTE

Before every flight, check to make sure the pitot covers have been removed and the static holes are unobstructed.

7.22 STALL WARNING AND ANGLE OF ATTACK SYSTEM

The stall warning and angle of attack system consists of an angle of attack transducer with internal heating for ice protection, a stall warning computer, an optional angle of attack indicator and a lighted stall indication on the pilot instrument panel.

The angle of attack transducer is an electro-mechanical device which protrudes into the airflow on the right side of the fuselage between the third and the fourth window.
By sensing the direction of the airflow the angle of attack transducer generates an electrical signal proportional to the angle of attack which is provided to the stall warning computer.

The stall warning computer conditions the signals provided by the angle of attack transducer and drives the optional angle of attack indicator on the pilot instrument panel and the fast/slow signal on EADI instrument.In addition the stall warning computer is connected with the flap system electronic control unit in order to change the stall threshold as a function of the flaps deployement. In the event of a malfunction the system will reset to the more conservative stall threshold condition with the flaps in completely retracted position. As well as a prestall condition is detected the stall warning computer causes the STALL red warning indication to illuminate, the aural warning box to emit a warning tone and, simultaneously, the autopilot to disengage if previously engaged.

A STALL FAIL amber caution light on the annunciator display will illuminate in the event of failure either of the stall warning system or of the heating element in the angle of attack transducer.

Two squat switches, one on the nose and the other one on the left landing gear leg, disengage the stall warning system when the airplane is on the ground.

The correct operation of the stall warning system can be checked during the preflight check by means of the SYS TEST selector. Refer to the "System Test" paragraph of this Section for information about the test procedure and description.

Anti-ice electrical heating of angle of attack transducer is controlled through the L PITOT & STALL-OFF switch located in the ANTI-ICE panel on the pilot instrument subpanel.

The system is powered from the essential bus through the STALL WRN 3-ampere circuit breaker on the pilot circuit breaker panel. Electrical power for heating of the angle of attack transducer is delivered from the left dual feed bus through the AOA HTR 10-ampere circuit breaker on the pilot circuit breaker panel.

7.23 ICE DETECTION SYSTEM

The ice detection system consists of an ice detector located on the right side of the airplane nose and a ICE amber caution lighted pushbutton on the pilot instrument panel.
The detector generates a 5-second electrical output pulse when a 0.5-millimeter thickness of ice is reached on the detector probe, and simultaneously heating is applied to the probe to be cleared from ice and becoming ready to repeat the cycle.
The detector output signal drives the ICE caution light and is utilized by the electronic control unit that controls the operation of the deicing boots on the left and right engine nacelle air intakes when the automatic mode is selected.

A visual ice accretion probe, located on the windshield, is provided as a back-up of the ice detector.

During an ice encounter, a periodic illumination of the ICE light (for 5 seconds) shall then be observed: the duration of the interval between two signals depends on the severity of the ice condition.
Should the amber light remain always ON (even in clear air), that would indicate a failure of the sensing probe: in this case the ice accretion may be checked observing the visual accretion probe.

A wing inspection light is installed in the outboard side of the left engine nacelle to allow the pilot, if necessary, to check icing conditions during night flight. This light is controlled by the WING INSP switch located in the LIGHTS panel: electrical power is suppliedby the right single feed bus through the WING INSP LT 3-ampere circuit breaker located on the right circuit breaker panel.

The ICE light flashing (at a rate of one second approximately) indicates that one or more of the anti-ice systems has not been switched on, or a malfunction exists, or the normal operating conditions have not yet been reached.
The systems monitored are: the left and right forward and main wings, the left and right engine ice vane/oil cooler intake.
The ICE light will continue to flash until reset by pushing the lighted pushbutton.
To locate the affected system, check on the annunciator panel the corresponding green light not illuminated.

The preflight test of the ice detection system is accomplished by selecting the ICE DET position on the SYS TEST panel and pressing the central button: the ICE amber light will illuminate then, after few seconds, will blink until the system is reset.

The ice detection system is fed from the essential bus through the ICE DET 10-ampere circuit breaker on the pilot circuit breaker panel.

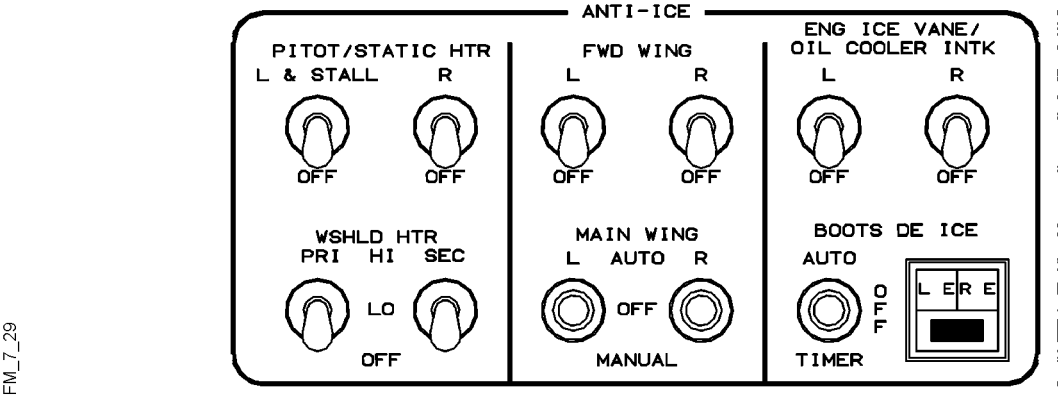

Figure 7-29. ANTI-ICE SYSTEM CONTROLS

7.24 WINDSHIELD DEFOG/ANTI ICE SYSTEM

Electric heating of the windshield is used to guard against and/or alleviate icing and fogging.
The windshield heating is based on six heating elements divided in two independent systems: one primary and one secondary.
The two systems are controlled by individual switches, labeled WSHLD HTR PRI and SEC, located in the ANTI-ICE panel on the lower portion of the pilot instruments panel: each switch can be set in HI, LO and OFF position.

Setting the switches to the LO or HI position, the heating elements operate as illustrated in the following table:

Switch position	LO	HI
PRI	ZONE 2, 5, 4: DE FOG	ZONE 2: ANTI ICE
SEC	ZONE 1, 5, 3, 6: DE FOG	ZONE 1: ANTI ICE ZONE 6: DEFOG

The windshield is thermostatically controlled against overheating. Three controllers drive the on/off cycling time of the heating elements as a function of the selected operating mode and of the temperatures measured by the thermal sensors located on each heating element.
The L and R WSHD ZONE red warning lights on the annunciator panel will illuminate either if an overheating condition is detected or a malfunction of a controller occurs.

The proper operation of each heating system (primary and secondary) can be checked by selecting the PRI WSHLD HTR switch to LO position while monitoring on the MFDI the electrical load: with both engines running an increase of power absorption between 20 and 30 Amp should be read; similarly, when selecting the SEC system to LO position, the increment should be between 25 and 35 Amp. The higher values correspond to peak condition or to low ambient temperature, while the lower ones to stabilized condition or high ambient temperature.

Separate circuit breakers for the heating and for the control system are provided. The electrical power is delivered as follows:

- from the left generator bus to the heating elements of ZONE 2 and 4 through the PLT L WSHLD Z HTR and of ZONE 5 through the PLT S WSHLD HTR, both rated at 0.5 Amp. and located on the left circuit breaker panel.
- from the right generator bus to the heating elements of ZONE 1 and 3 through the CPLT WSHLD HTR and of ZONE 6 through the PLT R WSHLD Z HTR, both rated at 0.5 Amp. and located on the right circuit breaker panel.

Primary system control circuits are fed by left single feed bus through the PRI WSHLD CONT 3 Amp circuit breaker located in the left panel and the secondary system control circuits by the right single feed bus through the SEC WSHLD CONT 3 Amp circuit breaker located in the right panel.

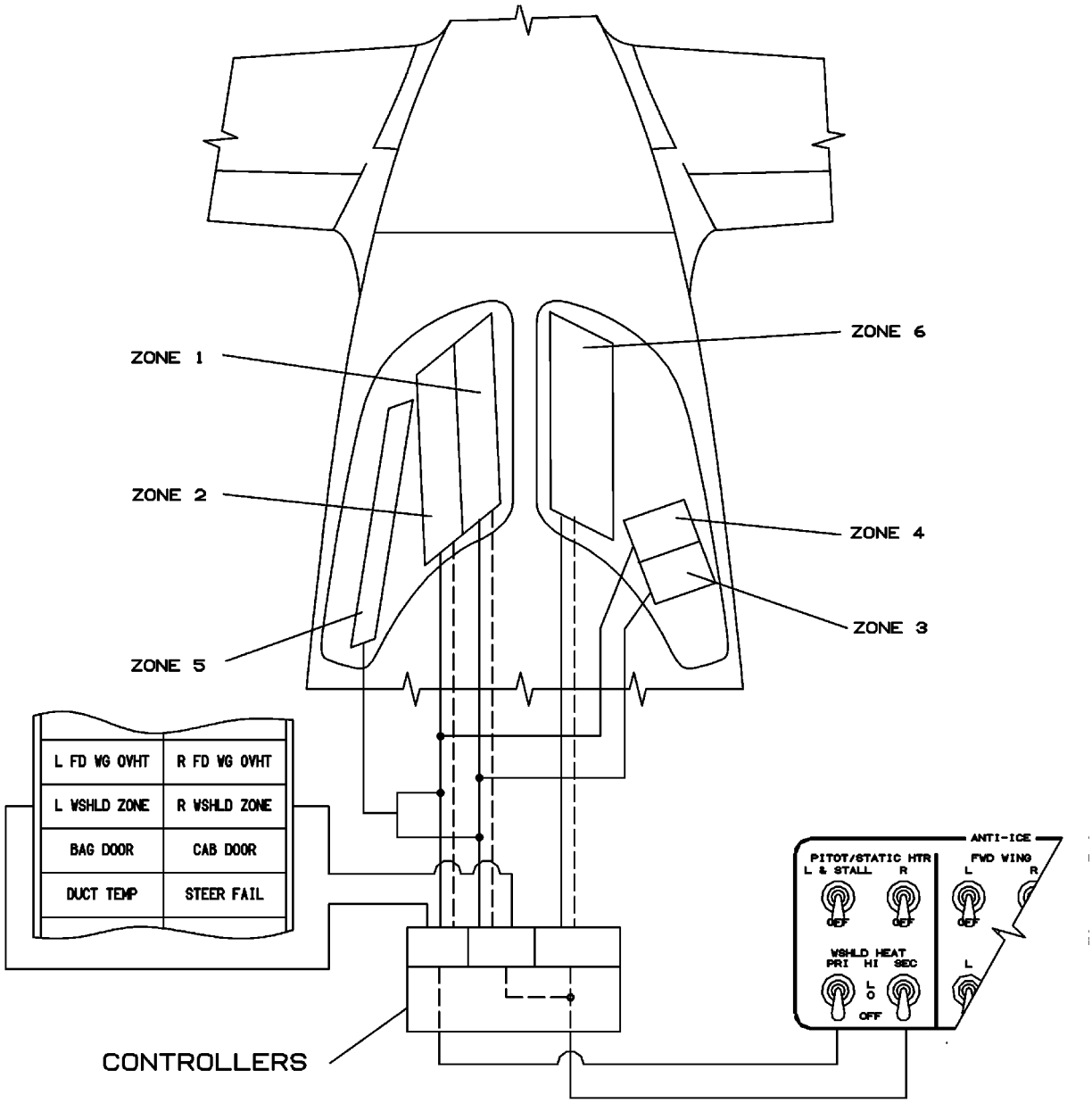

Figure 7-30. WINDSHIELD DEFOG/ANTI-ICE SYSTEM

7.25 SURFACES ICE PROTECTION

The main wing leading edge is protected against ice accretion by a hot air system utilizing the engine compressor delivery bleed air while the forward wing leading edge is protected by an electrical heating system. No anti ice system is provided on the horizontal and the vertical tail.

Wing anti-icing is accomplished by hot air flowing through three diffusers, one installed in the inboard and two in the outboard leading edge.
The system is controlled by two three-position switches (one for each wing) located in the ANTI-ICE panel on the bottom pilot's instrument panel and placarded L/R MAIN WING-AUTO-OFF-MANUAL.
The airflow coming from the engine high pressure port is routed, through the emergency pressurization/anti-ice lines, a control valve and an ejector to the wing leading edge.
Left and right emergency pressurization lines are interconnected in order to feed both wings anti-ice system in the event of engine failure.
The control valve can be controlled directly by the pilot (MANUAL mode) or by the automatic temperature control unit (AUTO mode).
The hot air, mixed by the ejector with cold ambient air, reaches the diffusers in the inboard and ouboard leading edge: discharges of the air are provided inside the engine nacelle and at the wing tip. The green L and R MN WG A/ICE lights, located on the annunciator panel, are controlled by a temperature switch for each wing, downstream the control valve, and will illuminate when a preset value is reached, giving a positive indication that the air is going to the leading edge and that the sensors and the controller are efficient.
In the AUTO mode the light will illuminate if the system is working properly and extinguish if the air temperature is too low or the system has failed.

Three temperature sensors have been installed (close to the warmest zone of the leading edge) which provide both the feedback to the control unit (AUTO mode only) and a warning signal in case of wing skin overtemperature (L or R MN WG OVHT red light will illuminate on the annunciator panel).
Control circuits are fed by the left and right dual feed bus through the 3 Amp. L and R WING HTR circuit breakers located respectively on the left and right circuit breakers panel.
Overtemperature sensing circuits are fed by the essential bus through the 3 Amp. WING OVHT circuit breaker on the left panel.

When the system operates in AUTO mode, two of the temperature sensors send signal to the control unit which calculate the main value and, as function of this value, operates the shut off/ control valve step by step or continuously.

The MANUAL mode of operation should be used only in case of a failure in the automatic mode (green L or R MN WG A/ICE lights not illuminated in AUTO mode) and the illumination of the advisory light indicates that the hot air is flowing to the diffusers at the right temperature value.
The third temperature sensor allows the pilot to control the maximum wing skin temperature (red L or R MN WG OVHT lights illuminated).

The OFF position of the switch causes the shut off/control valve to return in the closed position.

When the MANUAL mode of operation is necessary, pilot must periodically switch the system to MANUAL then OFF. (If the ice conditions are such to maintain the overtemperature light off, the switch may be maintained constantly on "MANUAL" till the overtemperature is detected).

The forward wing anti-ice system consists of eight heating elements installed in the leading edge.
The two-position switches on the ANTI ICE panel placarded L and R FWD WING-OFF allow the operation of the system.

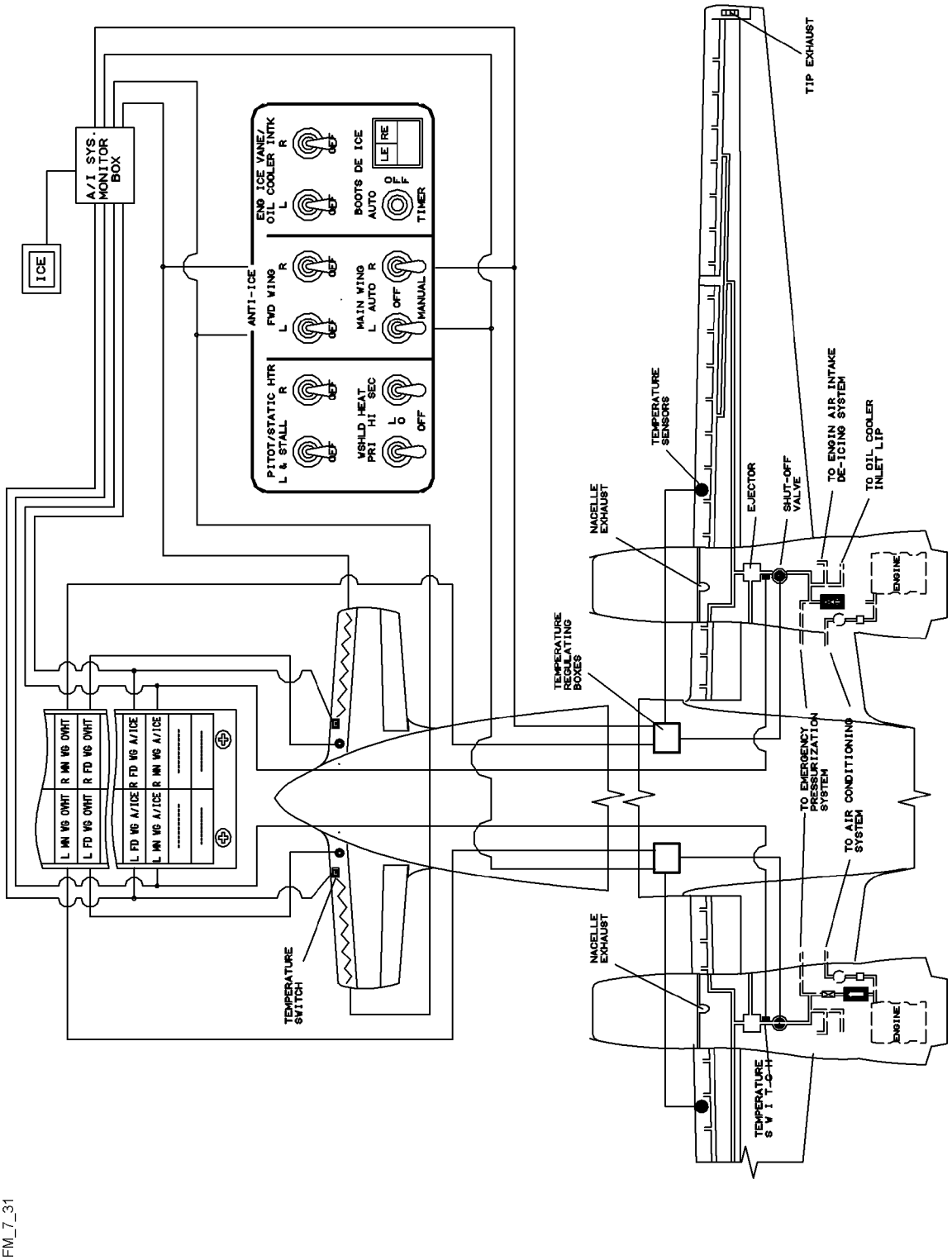

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Figure 7-31. SURFACE ICE PROTECTION

The leading edge temperature is automatically maintained below a preset value by two thermostats for each wing.
Should a malfunction occur to the thermostats, two thermal switches per each wing provide protection against overtemperature: in this case the L/R FWD WG OVHT red light will illuminate on the annunciator panel.
The green L and R FD WG A/ICE lights, located on the annunciator panel, are controlled by a temperature switch for each wing, and will illuminate when the skin temperature reaches a preset value.
Electrical power to control both systems (left & right) is supplied by the left and right single feed bus through the L and R FWD WING HTR 3 Amp. circuit breakers located on the left and right circuit breaker panels. Electrical power for the heating elements is supplied from the L and R GEN bus remote control circuit breakers (RCCB) located in the main junction box.
Two additional 0.5 Amp. circuit breakers, labeled L and R FWD WG HTR CONT and located in the left and right circuit breaker panel, are connected with the above mentioned RCCB.
In case of failure of a surface de-ice system, the corresponding green advisory light will extinguish and simultaneously the amber ICE light will blink until reset.

Consult the Normal Procedure section of this POH for the preflight check of the surfaces de-ice systems.

7.26 AVIONIC AND ELECTRONIC SYSTEMS

The standard avionics package includes dual radio communication system, dual audio, dual attitude and dual heading reference systems, dual VOR/ILS system, single ADF, single DME, dual Transponder, Radio Altimeter, weather radar and autopilot.
For autopilot operation consult Section 9 of this manual.

The communication equipment consists of a primary and a secondary VHF transceiver, each with a remote control/tuning unit, an antenna and interface with the aircraft audio system.
The primary system is powered by the essential bus through the 7.5 Amp. COMM 1 circuit breaker located in the pilot circuit breaker panel: this allows the operation without the need of powering all the aircraft avionics and the operation of the primary VHF is accomplished positioning the switch of the AVIONICS panel to COMM 1 ONLY position.
The secondary system is powered by the right avionics bus through the 7.5 Amp. COMM 2 circuit breaker on the copilot circuit breaker panel.

The audio system consists of dual independent audio control panels incorporating electronic circuitry to provide pilot and copilot with transmit, receive, intercom (both keyed and voice activated) and page capability.
The pilot panel is powered by the essential bus through the 3 Amp. AUDIO 1 circuit breaker located in the pilot circuit breaker panel whereas the copilot one by the right avionics bus through the 3 Amp. AUDIO 2 circuit breaker on the copilot circuit breaker panel.

The attitude reference systems include a primary and a secondary vertical gyro.
The primary, powered by the primary AC bus, provides attitude reference to EFIS (pilot electronic ADI) as well as to autopilot and weather radar antenna stabilization system.
The secondary vertical gyros, powered by the secondary AC bus, provides attitude information to the copilot electromechanical ADI and EFIS system (if the cross-side attitude sensor is selected on the EFIS control panel).

The heading reference system includes a primary and a secondary compass system. Each one consists of a directional gyro slaved to a flux detector unit.
The primary compass system is powered by the essential avionics bus through the 3 Amp. CMPS1 PWR circuit breaker located on the pilot panel and provides heading signals to EFIS system (pilot electronic HSI and Multifunction Display), copilot RMI (if installed) and Autopilot (through the EFIS system).

The secondary compass system is powered by the right avionics bus through the 3 Amp. CMPS2 PWR circuit breaker (on the copilot circuit breaker panel) and provides heading data to the copilot electronic HSI, pilot RMI and EFIS system (if the cross-side heading sensor is selected on EFIS control panel).

Two VHF radio navigation systems (VOR/ILS) are installed both interfaced with the same set of three antennas (VOR/LOC, GS and MKR). The standard installation consists of:

- a primary VHF/NAV system, based on a VOR/ILS receiver with its own remote control/ tuning unit, providing signals to EFIS system, pilot RMI, copilot RMI (if installed), copilot electronic HSI, copilot Marker Beacon indicator and audio system.
  The system is powered by the essential avionics bus through the 3 Amp. NAV1 PWR circuit breaker on the pilot circuit breaker panel.
  AC reference is provided by the primary AC bus.
- a secondary VHF/NAV system, similar to the primary one but with Marker Beacon receiver held in a non-operational mode, providing signals to copilot ADI and electronic HSI, EFIS system, pilot RMI, copilot RMI (if installed) and audio system.
  The system is powered by the right avionic bus through the 3 Amp. NAV2 PWR circuit breaker on the copilot circuit breaker panel.
  AC reference is provided by the secondary AC bus.

At customer option, also the Marker Beacon receiver of the secondary VHF/NAV system can be switched to the operational mode: with such installation indipendent "on side" MKR indication and audio signals are available to the pilot and copilot.

The Automatic Direction Finder (ADF) system consists of a receiver, a remote control/tuning unit and an antenna.
It is fed by the right avionics bus through the 3 Amp. ADF1 circuit breaker located on the copilot circuit breaker panel and provides bearing data to EFIS system (pilot electronic HSI and Multifunction Display), copilot electronic HSI, pilot RMI and copilot RMI (if installed).
A dual ADF installation can be provided as optional equipment. Bearing infomation from the secondary ADF is displayed on the pilot RMI and on the copilot RMI (if installed). The sytem is fed by the right avionics bus through the 3 Amp. ADF2 circuit breaker located on the copilot circuit breaker panel.

The Distance Measuring Equipment (DME) consists of a DME transceiver (remotely controlled by the primary VHF/NAV control/tuning unit) and an antenna and provides slant range distance information to EFIS system and copilot electronic HSI.
The system is powered by the left avionics bus through the 3 Amp. DME1 circuit breaker located in the pilot circuit breaker panel.

The weather radar (optionally with turbulence detection capability) consists of a control panel and a transceiver/antenna.
Weather (and turbulence) information are displayed on EFIS (pilot electronic HSI and/or Multifunction Display). Possibility exists that signal returns become visible on the radar map as either three separated echoes at 10, 12 and 2 o'clock (flying over the sea surface) or a single "horse shoe" (flying over the ground), at a distance equivalent to the airplane altitude while looking for weather at short distance (25 NM and lower ranges) and tilt up. Intensity of the false echoes increases with the gain setting.
The system is powered by the right avionics bus through the 5 Amp. RDR METEO circuit breaker panel on the copilot circuit breaker panel and the AC reference for pitch and roll signal is provided by the primary AC bus.

A primary and a secondary ATC transponder are installed: both apparatus are controlled by a single control unit located in the center section of the instrument panel.
Where required by regulations, in lieu of the primary standard ATC (Mode A and Mode C) an ATC/Mode S apparatus can be installed providing Mode A, Mode C and Mode S operation capability.
In the standard installation both the primary and secondary ATC transponder are connected with the pilot encoding altimeter as single coded altitude information source.
In the event two independent coded altitude reporting system are requested an optional secondary encoder altimeter can be installed on the copilot instrument panel to be connected with the secondary ATC transponder.
The primary transponder is powered by the essential avionics bus through the 3 Amp. XPNDR1 circuit breaker located on the pilot circuit breaker panel whereas the secondary is fed by the right avionics bus through the 3 Amp. XPNDR2 circuit breaker on the copilot circuit breaker panel.

The radio altimeter installed on the airplane consists of a transceiver, an indicator/control unit and two antennas.
The system, powered by the right avionics bus through the 3 Amp. RADIO ALTM circuit breaker on the copilot circuit breaker panel, interfaces with EFIS system and copilot ADI. Dual D.H. setting capability is offered while radio altitude and decision height information are provided both on pilot and copilot instrument panel. Radio altitude signal is also supplied to the autopilot system for aircraft control during ILS approach.

All the radios, gyros and weather radar are installed in the nose avionics bay. Control/tuning units, as well as audio control panels are on the instrument panel.

Other avionic and electronic packages are available as option.

7.27 ENGINE FIRE EXTINGUISHING SYSTEM (OPTIONAL EQUIPMENT)

In case of an engine fire a cockpit controlled engine fire extinguishing system is available. The fire warning detection is provided by a continuous type thermal sensor running through each engine compartment. Fire warning is provided by the red L and R FIRE warning lights, located at the top of the annunciator display panel: when the fire extinguishing system is installed, additional fire warning is provided by the L and R ENG FIRE EXT lighted control pushbuttons, located each side of the AUTOPILOT CONTROLLER panel, which illuminates together with the L and R FIRE on the annunciator panel. The fire detection system can be checked for proper operation through the system test selector (Refer to the System Test paragraph of this Section).
Each engine nacelle contains a cylinder full of fire extinguishing agent, supercharged with gaseous nitrogen. The fire extinguisher in the engine nacelle may be manually activated by pressing the corresponding L or R ENG FIRE EXT lighted pushbuttons. An electrically operated cartridge (firing squib), screwed into the cylinder housing assembly,provides the means of releasing the extinguishing agent. An explosive charge shatters the seal on the cylinder pod,releasing the extinguishing agent through tubes into the hot section of the engine and engine accessory section.

NOTE

The engine fire extinguisher is a single shot system with one cylinder for each engine.

CAUTION

Fire extinguisher capability has not been evaluated by Airworthiness Authority.

To prevent the cylinder from bursting from the heat, a fitting and integral valve releases the contents when the internal temperature of the charged cylinder exceeds 215°F. A gauge mounted on each cylinder, visible from the outside through a window in the outboard side of each nacelle, indicates the internal pressure, which depends on ambient temperature as illustrated in Figure 7-32.
The engine fire extinguishers are powered directly from the hot battery bus through the LH and RH FIRE EXT 5 Amp circuit breakers located on the main junction box circuit breaker panel in the baggage compartment.

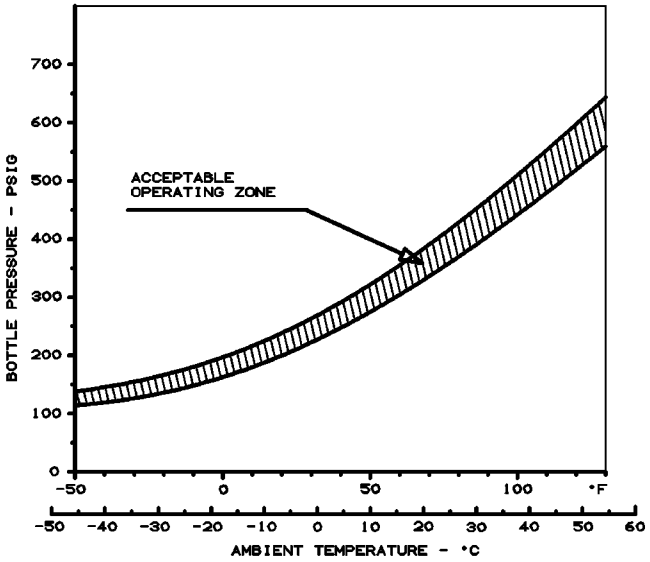

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Figure 7-32. FIRE EXTINGUISHER BOTTLE PRESSURE Vs. AMBIENT TEMPERATURE

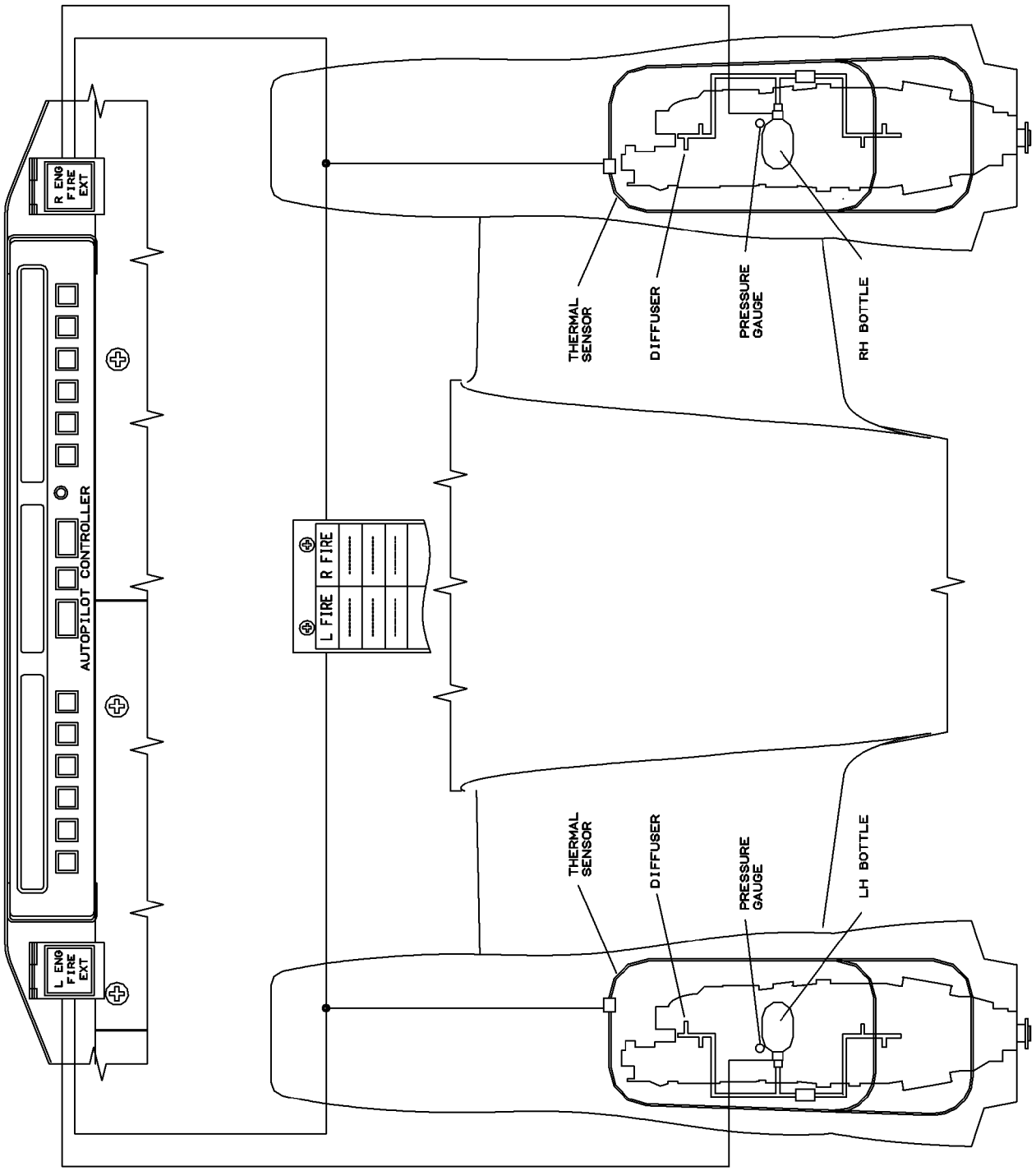

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Figure 7-33. ENGINE FIRE EXTINGUISHING SYSTEM (OPTIONAL EQUIPMENT)

7.28 EMERGENCY LOCATOR TRANSMITTER

7.28.1 DORNE MARGOLIN TYPE DM ELT8 SYSTEM

The Emergency Locator Transmitter (ELT) Type DM ELT8 System operates, on a self contained battery, at 121.5 and 243.0 MHz frequencies.
The system is housed in the top fin fairing, which is fitted with a removable access cover: a Remote Control switch, located in the airplane baggage compartment on the right side of the door, allows the remote control of the transmitter.

On the ELT unit, a switch placarded ON, OFF, AUTO allows the unit to be set to the automatic mode so that it will transmit only after activation by impact. The unit will continue to transmit until the battery is drained or until the switch is moved to the OFF position.
The ON position is provided as a means of activation if the automatic feature was not triggered by impact or to periodically test the function of the transmitter.
The OFF position should be selected while changing the battery or to discontinue transmission after the unit has been activated.

The Remote Control switch has two positions placarded ON/TEST and AUTO and the switch handle must be pulled out then positioned.
The ELT can be operated by the Remote Control Switch only if the transmitter switch is set to AUTO.
For normal operation the Remote Control switch is set to AUTO position.
To turn off the ELT and reset to its automatic mode condition, set the Remote Control switch to ON/TEST position, then back to AUTO.

Should an emergency occur where manual activation of the ELT is desired, set the Remote Control switch to ON: the distress signals will immediately be transmitted.

The locator should be checked during the preflight ground check. Tune a radio receiver to 121.5 MHz and place the Remote Control switch in the ON/TEST position: (ELT will start transmitting). After a one second test period (2 sweeps of the warble tone), place the switch in AUTO.
If the ELT does not transmit while the Remote Control switch is in the ON/TEST position, the transmitter must be checked to verify that the ELT switch position is in AUTO and that the ELT is operational.

NOTE

If for any reason a test transmission is necessary, the test transmission should be conducted only in the first five minutes of any hour and limited to three audio sweeps.

A battery replacement date is marked on the transmitter label: the battery must be replaced on or before this date. The battery must also be replaced if the transmitter has been used in an emergency situation or if the accumulated test time exceeds one hour, or if the unit has been inadvertently activated for an undetermined time period.

7.28.2 TECHTEST TYPE 503 SYSTEM

The Techtest Ltd. Type 503 Automatic Fixed Emergency Locator Transmitter ELT(AF) is a battery powered system consisting of a transmitter, a G-switch unit, a mounting tray, an antenna and a remote control unit.
The transmitter, complete with a battery package, and the G-switch are close coupled and installed on the mounting tray as a single unit housed in the vertical fin top fairing together with the system antenna. The remote control unit is located on the pilot instrument panel.
When activated the transmitter can operate as a beacon on the 121.5 and 243.0 MHz emergency frequencies as well as on the 406.025 MHz frequency including the digitally encoded message for reception by the COSPAS/SARSAT satellite system.
The system features an automatic activation through the G-switch in the event of an airplane impact or can be manually activated by the crew through the cockpit control panel.

The G-switch is provided with a test switch spring loaded to the OFF position and a 3-position (ON, OFF and ARM) switch. Normal operations of the ELT are initiated by setting to ARM the 3-position switch: in the armed condition the system is readied and can be activated by either the G-switch sensing an excess load or by manual switching from the cockpit control panel. In addition the ELT can be manually activated at the G-switch by moving from OFF or ARM to ON the 3-position switch.
If the ELT is switched to ON at the G-switch the following actions are requested for switching it to OFF again:

– Moving of the 3-position switch from ON through OFF to ARM
– Pressing the separate test switch to TEST momentarily
– Moving the 3-position switch to OFF.

The cockpit control panel is provided with a 3-position switch, protected by a safety guard against inadvertent operations, and an indicator lamp associated with an in-built sounder. The switch shall rest in the center OFF position during normal operations. The ON position allows the intentional manual activation of the ELT. The momentary spring loaded TEST/RESET position allows either starting the system test or resetting the ELT to OFF after either an intentional manual switching to ON or a G-switch triggering to ON due to an excessive load sensed during ground handling: in both events an 11-seconds delay and warning is allowed before the system switching to ON. During the delay period the lamp and sounder give a series of warning pulses.

The system test requires that the ELT is in the armed condition. The test can be initiated by pressing and helding either the cockpit control panel 3-position switch to the TEST/RESET position or the G-switch unit test switch to the TEST position. After actuating the test switch a delay of some 3 to 4 seconds will occur before two swept tones and indicator lamp illuminations are generated followed after a short space by a beep.
The two swept tones are a check of the 121.5 MHz and 243.0 MHz, and the beep of the 406.025 MHz.

NOTE

Normally the test will give the indicated pass results on the second or third attempt after a period of inactivity.

NOTE

In order to save the ELT battery capacity and assure the battery full operating life it is recommended that the system test rate is limited to a maximum of one test of one cycle per day.

The ELT system is powered from the airplane 28 Vdc RH AVIONICS bus through the ELT 3 Amp circuit breaker, located on the copilot circuit breaker panel, and the AVIONICS Master Switch.

The ELT transmitter battery package assures a minimum 24 hours use at 406.025 MHZ and 48 hours use at 121.5 MHz and 243.0 MHz during 5 years of unused installed life, provided that just only one system test per day is performed.
The G-switch is provided with an internal rechargeable battery that maintains the system at an operational readiness for 10 hours after a total loss of the airplane electrical power supply. Should the airplane power supply to the ELT system be removed for more than 10 hours with the ELT left switched ON then the G-switch internal battery will be discharged. The restoration of the airplane power to the ELT immediately starts the recharge cycle and the safety feature is restored. The battery is fully operational within 30 minutes of power being restored to the ELT system. The G-switch battery needs to be replaced every 2.5 years.
In the event of a prolonged airplane out of service period the ELT system should be switched from ARM to OFF in order to disarm the operations.

7.29 PORTABLE CABIN FIRE EXTINGUISHER (OPTIONAL EQUIPMENT)

A portable fire extinguisher is housed in a cabinet behind the pilot's seat.
The extinguisher is suitable for use on liquid or electrical fires and the HALON 1211 extinguishing agent is fully discharged in about 10 seconds.
A pressure gauge indicates, when the needle is in the green sector, a fully charged bottle.

To operate the extinguisher, hold upright in either hand, slide the (red) safety catch down with thumb, direct the nozzle towards the base of the fire source and sqeeze the lever with the palm of the hand. This will cause a piston valve in the operating head to fracture the frangible plug seal on the top of the container, thus releasing the extinguishant through the discharge nozzle which is designed to give a wide, flat pattern.

Releasing the lever closes a secondary seal and interrupts the flow of the extinguishant, thus retaining part of the charge without waste, for dealing with re-ignition or flash-backs, should they occur.

On first pressing the lever, a red indicator disc is ejected from the rear of the operating head. This provides a visual indication of partial or complete discharge.

A partly or fully discharged cylinder should be replaced immediately after use.

WARNING

The concentrated agent from extinguishers using HALON 1211 or the by-products when applied to a fire are toxic when inhaled. Ventilate the cabin as soon as possible after fire is extinguished to remove smoke or fumes. Use oxygen, if necessary.

7.30 FLITE PHONE (OPTIONAL EQUIPMENT)

The flight phone installation consists of the Global-Wulfsberg Flitefone VI Radiotelephone system.
The Flitefone VI system is designed to provide full duplex airborne telephone service. The unit may operate from either the cockpit or cabin mounted handset.
The system is completely compatible with existing manual ground stations and the Air/Ground Radiotelephone Automated Service (AGRAS).

The Flitefone VI may receive calls from the ground when they are placed to the AGRAS Credit Card Number or the QM number in the airborne unit.
With two handsets it is possible for the pilot to talk to the passengers and vice-versa.

The system consists of a transceiver unit, located in the aft baggage compartment, two handsets located in the cockpit and in the cabin and an antenna located in the airplane bottom, close to the landing gear compartment.

Power supply is derived from the right avionics bus through the PHONE 5-ampere circuit breaker, located in the right circuit breaker panel, only when the AVIONICS switch is set to the ON position.

NOTE

The Flitefone operation is limited to those Countries where its use is allowed.

7.31 CABIN DISPLAY SYSTEM (OPTIONAL EQUIPMENT)

The B&D Model 2504 Series Cabin Display system is a digital air data system which displays to the passengers True Airspeed, Altitude, Temperature and Time.

The system consists of a pressure transducer, a temperature probe, mounted flush on the belly of the airplane and a computer unit.

Power supply is derived from the right avionics bus through the CABIN DISPL 1-ampere circuit breaker, located in the right circuit breaker panel, only when the AVIONICS switch is set to the ON position.

7.32 UNDERWATER ACOUSTIC BEACON (OPTIONAL EQUIPMENT)

An optional Dukane DK100 Underwater Acoustic Beacon can be installed on the left wall of the rear baggage compartment by means of a suitable mounting support.

The completely independent battery-powered beacon, not connected to the airplane electrical power supply system, allows localizing the airplane, in the event of a water crash, up to a 20,000 ft depth.
The equipment radiates a pulse acoustic signal as long as its water sensitive switch is sunk for at least 30 days.
The 37.5 KHz. pulse acoustic signal can be detected at a distance from 1800 up to 3600 meters depending disturbing elements.

The beacon internal battery requires to be replaced every 6 years, while a periodic equipment cleaning and testing is recommended on a 6-months interval basis.

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SECTION 8

AIRPLANE HANDLING, SERVICE AND MAINTENANCE

8.0 GENERAL

Section 8 of this handbook provides information on cleaning, inspection, servicing and maintenance of the airplane.

If your airplane is to retain the new plane performance and dependability, certain inspection and maintenance requirements must be followed. It is wise to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered in your locality.

Keep in touch with your authorized PIAGGIO AVANTI Service Center to take advantage of their knowledge and experience. They know your airplane and how to maintain it. They will remind you when lubrications and oil changes are necessary, and about other seasonal and periodic services.

All correspondence concerning your airplane should include the airplane model and serial number. This information may be obtained from the identification plate located on the forward wall of the baggage compartment. Refer to the Airplane Maintenance Manual for an illustration of the identification plate.

8.1 INSPECTION REQUIREMENTS

As detailed in Part. 91.217, Subpart D of the Federal Aviation Regulations, airplanes must be inspected in accordance with an authorized inspection program. The inspection requirements defined in Chapter 5 of P180 Maintenance Manual are the manufacturer's recommended procedures and are tailored to satisfy the requirements of FAR 91.217. A written notice must be sent to the local government aviation agency having jurisdiction over the area in which the airplane is based, providing the following information:

1. Make, Model and Serial Number.
2. Registration Number.
3. Inspection Program Selected.
4. Name and Address of the person responsible for scheduling the inspections required.

Additional inspections may be required by the government aviation agency. These inspections are issued in the form of Airworthiness Directives and can apply to the airframe, engines and/or components of the airplane. It is the owner's responsibility to insure compliance with these directives. In some cases, the Airworthiness Directives require repetitive compliance; therefore, the owner should insure inadvertent noncompliance does not occur at future inspection intervals.

NOTE

Refer to FAR Parts 43 and 91 for properly certificated agency or personnel to accomplish the inspections.

8.1.1 SERVICING REQUIREMENTS

For quick and ready reference, quantities, materials, and specifications for frequently used service items (such as fuel, oil, etc.) are shown in this section.

In addition to the Preflight Inspection covered in Section 4, complete servicing, inspection, and test requirements for your airplane are detailed in the Airplane Maintenance Manual. The Maintenance Manual outlines all items which require attention at 100-, 500- and 1500-hour as well as 12-months intervals plus those items which require servicing, inspection, and/or testing at special intervals.

Since your authorized PIAGGIO AVANTI Service Center conducts all service, inspection, and test procedures in accordance with applicable Maintenance Manuals, it is recommended that you contact your authorized PIAGGIO AVANTI Service Center concerning these requirements and begin scheduling your airplane for service at the recommended intervals.

Depending on various flight operations, your local government aviation agency may require additional service, inspections, or tests. For these regulatory requirements, owners should check with local aviation officials where the airplane is being operated.

8.1.2 PREVENTIVE MAINTENANCE

Part 43 of the FAR's allows the holder of a pilot certificate, issued under Part 61, to perform preventive maintenance on any airplane owned or operated by him that is not used in air carrier service. Refer to FAR Part 43 for a list of preventive maintenance items the pilot is authorized to accomplish.

NOTE

Prior to performance of preventive maintenance, review the applicable procedures in the Airplane Maintenance Manual to insure the procedure is properly completed.

All maintenance other than preventive maintenance must be accomplished by appropriately licensed personnel. Contact your authorized PIAGGIO AVANTI Service Center for additional information.

Pilots operating airplanes should refer to the regulations of the country of certification for information on preventive maintenance that may be performed by pilots.

8.2 ALTERATIONS OR REPAIRS TO THE AIRPLANE

Alterations or repairs to the airplane must be accomplished by appropriately licensed personnel. If alterations are considered, the government aviation agency should be consulted to insure that the airworthiness of the airplane is not violated.

8.3 GROUND HANDLING

8.3.1 TOWING

The airplane should be moved on the ground with the aid of the nosewheel towing bar provided with the airplane. The tow bar is designed to attach to the nose wheel axle.
Figure 8-1 shows minimum turning radius on towing.

CAUTION

Disengage steering link connecting pin. Do not push or pull on propellers or control surfaces when moving the airplane on the ground.

Do not tow the airplane when the parking brake is engaged.

At end of towing operations reconnect steering link.

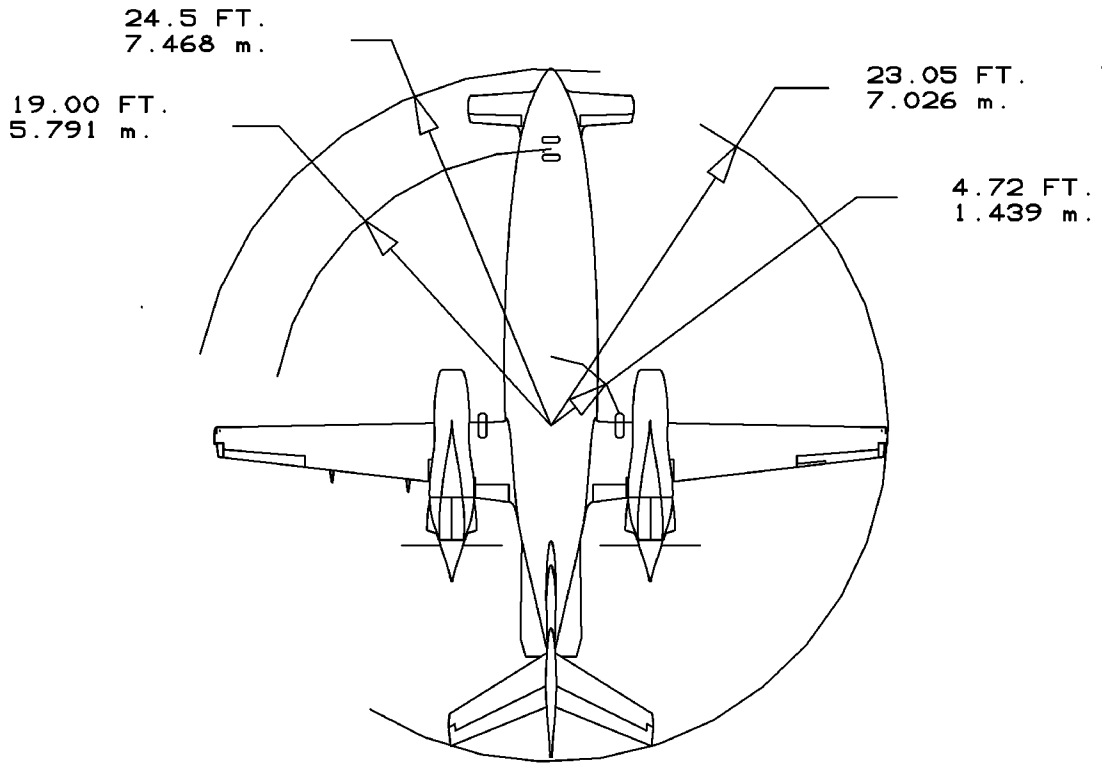
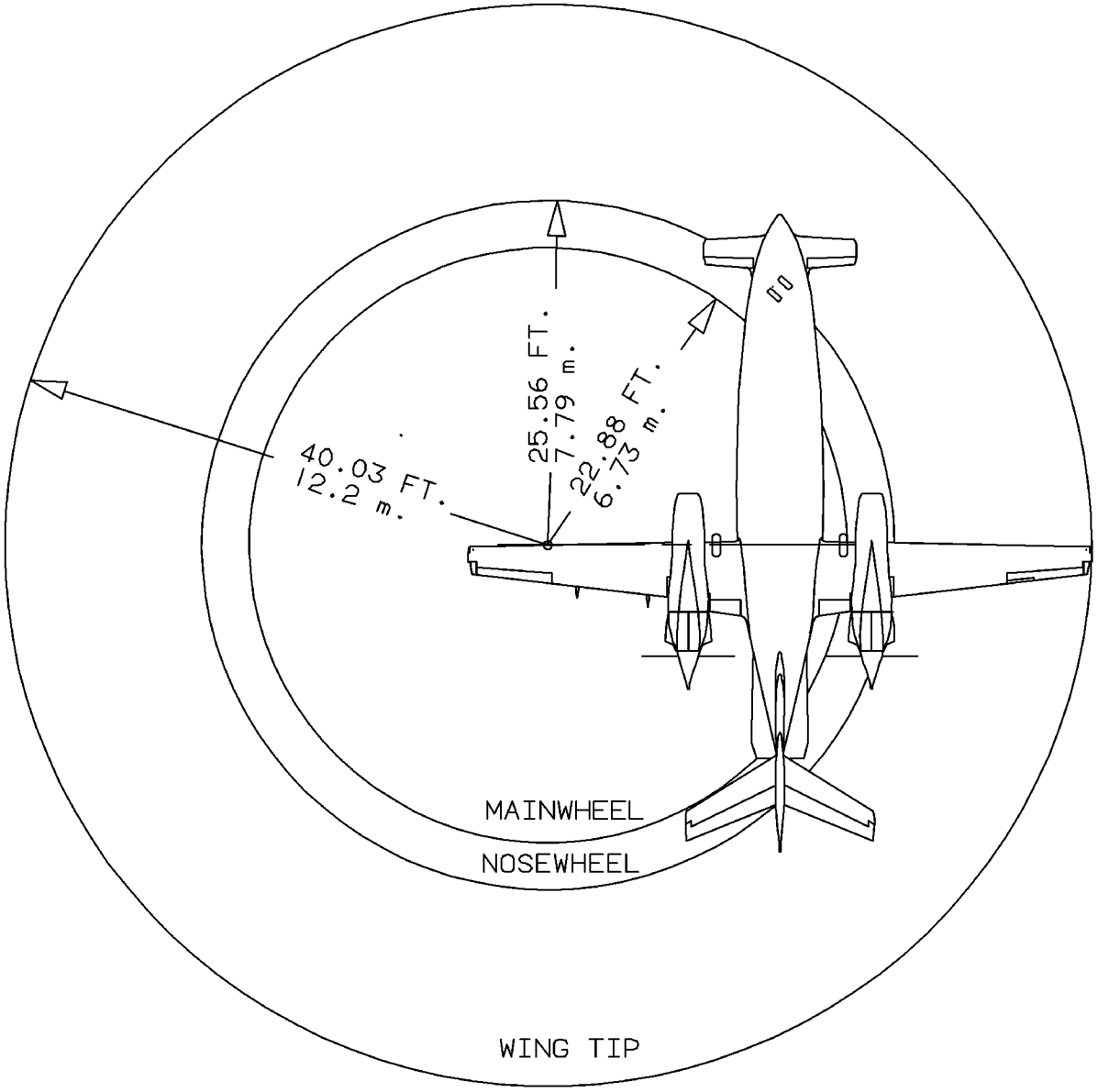


Figure 8-1. MINIMUM TURNING RADIUS ON TOWING

8.3.2 TAXIING

Figure 8-2 on page 8-5 shows minimum nose wheel steering turning radius.
Before attempting to taxi the airplane, ground personnel should be instructed and approved by a qualified person authorized by the owner. Engine starting and shut-down procedures and taxiing techniques should be explained. When it is ascertained that the propeller back blast and the taxi areas are clear, powers should be applied to start the taxi roll, and the following procedures should be followed:

1. Insure cabin and baggage doors are closed.
2. Set the parking brake.
3. Set hydraulic pump switch to HYD.
4. Start engines.
5. Set steering selector to TAXI.
6. Remove wheel chocks.
7. Disengage parking brake.
8. Set condition levers to GROUND IDLE.
9. Propeller thrust may be modulated using the power levers.
10. When taxiing avoid holes and ruts.
11. Observe wing clearances when taxiing near buildings or other stationary objects. If possible, station an observer outside to guide the airplane.
12. Do not operate the engines at high RPM when running up or taxiing over ground containing loose stones, gravel, or any loose material that might cause damage to the propeller blades.
13. After taxiing forward a few feet, apply the brakes to determine their effectiveness.
14. While taxiing, make slight turns to ascertain the effectiveness of the steering.
15. When the airplane is stopped on the taxiway or runway and brake freeze-up occurs, actuate the brakes several times using maximum pressure.To reduce the possibility of brake freeze-up during taxi operation in severe weather conditions, one or two taxi slow-downs may be made using light brake pressure, which will assist moisture evaporation within the brake.



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NOTE: The figure shows the minimum turning radii based upon a maximum steering deflection of 50°.

Figure 8-2. TURNING RADIUS ON TAXING

8.3.3 PARKING

When parking the airplane, be sure that it is sufficiently protected against adverse weather conditions and that it presents no danger to other aircraft. When parking the airplane for any length of time or overnight, it is suggested that it be moored securely.

1. When parking the airplane, head it into the wind if possible.
2. Align the nosewheel.
3. Set the parking brake by pulling the parking brake handle and then rotating the handle 90° clockwise to lock the handle.

NOTE

The parking brake can be actuated: if the hydraulic power pack is operating by pulling the parking brake handle; if the hydraulic power pack is inoperative by pulling the parking brake handle and then pressing (more than one time) on rudder pedals toe.

NOTE

Care should be exercised when setting brakes that are overheated, or during cold weather when accumulated moisture may freeze brake shoes and discs together.

When excessive moisture/freezing temperature conditions exist, parked aircraft should have their brakes released and wheel chocks properly positioned.

4. Aileron and elevator and rudder controls should be secured properly and flaps retracted.
5. Before leaving the airplane locking of the emergency window release handle is recommended.
   For this purpose, on S.N. 1034 and up airplanes, a red flagged safety pin is provided to be engaged in a suitable locking hole close to the internal emergency window release handle.

8.3.4 MOORING

The airplane should be moored for immovability, security and protection. The following procedures should be used for the proper mooring of the airplane:

1. Head the airplane into the wind if possible.
2. Retract the flaps.
3. Immobilize the ailerons, the elevator and the rudder by installing the controls gust lock.
4. Place chocks both fore and aft of the main wheels.
5. Secure tie-down ropes to the attachment points located under the wings and close to the nose wheel strut (same points used for jacking). When using rope of non-synthetic material, leave sufficient slack to avoid damage to the airplane should the ropes contract.

CAUTION

Use bowline, square knots, or locked slip knots. Do not use plain slip knots.

6. Overnight or in blowing snow or dust, install dust covers on engine nacelles. Attach propeller restrainers to prevent windmilling.

NOTE

The propeller may windmill even in light winds. A windmilling propeller is a safety hazard. Prolonged windmilling at zero oil pressure can result in bearing damage.
The propeller should be secured with one blade down when mooring for safety and drainage purposes.

7. Install pitot covers and static discharge wicks red warning tags. Be sure to remove all covers and tags before flight.
8. Cabin and baggage doors should be locked when the airplane is unattended.

8.3.5 JACKING

The airplane is equipped with a jacking provision on each main spar outboard of the engine nacelle and one on fuselage located at right side of nose gear strut.
To jack the airplane, proceed as follows:

1. Install jack pads.
2. Place jacks under the wing and nose jack pads.
3. Raise the three jacks simultaneously until all wheels clear the surface, maintaining a level airplane.

8.3.6 LEVELING

Three leveling marks are provided to level the airplane: one is located on the forward mast of cabin door, the other two are located each side to the fuselage, close to the rearmost baggage compartment frame.
The airplane may be leveled either on jacks or on wheels using the communicating vessel system and deflating the tires or the shock absorbers.
Normally the airplane is leveled first laterally then longitudinally.

8.3.7 GROUND POWER UNIT

The ground power unit circuitry of the airplane is capable of accepting 400 amperes continuously and current surges up to 1200 amperes for short durations (few sec), that may occur during engine starts.

GROUND POWER UNIT CONNECTION

To connect a ground power unit proceed as follows:

1. Verify all switches are OFF.
2. Set BAT switch to BAT position.
3. Set MFDI selector to BUS VOLTS position, and read bus voltage.

CAUTION

If bus voltage is less than 21.5 VDC, the battery must be serviced or replaced before flight.
If bus voltage is between 21.5 and 23.0 VDC, allow 15 minutes of ground power unit battery recharging.

4. Set BAT switch to OFF.
5. Set ground power unit voltage to 28.25 ± 0.25 volts.
6. Set ground power unit switch to OFF position.
7. Open the ground power unit receptacle door.
8. Connect ground power unit to airplane.
9. Set ground power unit switch to ON position.
10. Set BAT switch to BAT position.
11. EXT POWER annunciator is ON and MFDI indicates a bus voltage greater than that read at step 3.

NOTE

If the airplane is equipped with the optional overvoltage protection (Kit P/N 80KA00038-801) on the external power supply line the D.C. system automatically disconnects from the ground power unit should an overvoltage condition occur. The ground power unit operation is automatically recovered as soon as the voltage goes down to approximately 30 volts D.C.

GROUND POWER UNIT DISCONNECTING

1. Set G.P.U. switch to OFF position.
2. Disconnect the ground power unit.
3. Close the ground power unit receptacle door and secure.
4. Set generators L and R switches to ON position.

8.4 GROUND SERVICING

8.4.1 HYDRAULIC SYSTEM SERVICE

Hydraulic system service consists primarily of fluid level and filter impending check. To perform the above listed checks proceed as follows:

1. Open the ground test/refueling panel access door.
2. Note HYD LEVEL and HYD FILTER annunciators status.
3. Set GROUND TEST switch to LAMP position and hold.
4. HYD LEVEL and HYD FILTER annunciators are ON.
5. Release GROUND TEST switch.
6. Note HYD LEVEL and HYD FILTER annunciators status.
7. Set GROUND TEST switch to SYST position and hold.
8. After few seconds HYD LEVEL and HYD FILTER annunciators are ON.
9. Release GROUND TEST switch.
10. Observe HYD LEVEL annunciator.

NOTE

If HYD LEVEL annunciator is ON fluid top up is required. If HYD FILTER annunciator is noted ON at steps 2 and 6 hydraulic filter element replacement is required.

HYDRAULIC POWER PACK FLUID FILLING

If fluid top up is required, hydraulic fluid MIL-H-5606 should be added by utilizing the filler cap located on the baggage compartment left side, just forward the baggage door mast and the overfill drain valve, located on the left main gear well. To top up proceed as follows: open overfill drain valve, remove filler plug and using an appropriate oil servicing unit fill till to have a tap from overfill drain valve, close overfill drain valve and install filler plug.

HYDRAULIC FILTER REPLACEMENT

To replace the hydraulic filter element refer to the airplane maintenance manual.

8.4.2 LANDING GEAR SERVICE

The operation of the landing gear shock absorbers is standard for the air-oil type. Hydraulic fluid passing through an orifice serves as the major shock absorber, while air compressed statically acts as a taxiing spring.

All of the shock absorbers are inflated through readily accessible valves. All major attachments and actuating bearings are equipped with grease fittings for lubrication of the bearing surfaces, and should be lubricated periodically (Refer to the Lubrication Chart in the Maintenance Manual).

In the event the shock absorber slowly loses pressure and extension, the most probable source of trouble is the air valve attachment or the core of the air valve. These parts should be checked first to determine whether or not air leaks are occurring. If hydraulic fluid is evident on the exposed oleo strut plate the unit may need to be replaced.

To reinflate a shock absorber installed on airplane proceed as follows: lift the airplane till to have the wheels clear of ground. Connect the nitrogen supply to the charging valve and pressurize slowly to fully extend the unit. Increase the nitrogen pressure till 985 PSI for main gear and 120 PSI for nose gear.

NOTE

To avoid airplane unbalancing it is advisable to service both main gear shock absorbers.

8.4.3 BRAKE SERVICE

The brake service consists primarily of brake wear check. To carry out this check pressurize the brake system and check the wear indicator pin. A fully worn brake condition is indicated by a flush condition of wear indicator pin respect to the bushing.
If it necessary to bleed the brake system, consequently to an anomalous brake operation, excessive movement of rudder toe pedal or spongy brakes, refer to the Maintenance Manual.

NOTE

See Maintenance Manual for rigging and adjustment of landing gear.

8.4.4 TIRE SERVICE

For maximum service from the tires keep them inflated to the proper pressures of 64 PSI for the nose wheel and 115 PSI for the main wheels.

NOTE

For airplane resting on wheels increase the inflating pressure of 4%.

When inflating the tires, visually inspect them for cracks and breaks. If necessary, reverse the tires on the wheels or interchange them for even wear. All tires and wheels are balanced before original installation, and the relationship of tire, wheel and tube should be maintained upon reinstallation. If new components are installed, it may be necessary to rebalance the wheels with the tires mounted. Out-of-balance wheels can cause extreme vibration during takeoff and landing.

8.4.5 PROPELLER SERVICE

Since propellers will pick up loose pieces of rock or debris from the ramp and runway, the blades should be checked periodically for damage. Minor nicks in the leading edge of blades should be dressed out and all edges rounded, since cracks sometimes start from such defects. Use fine emery cloth for finishing the depressions. Repairs should be accomplished by authorized personnel. Refer to FAA Advisory Circular 43.13-1A for blade repair recommendations and repair limitations. The daily inspection should include examination of blades and spinner for visible damage or cracks and inspection for grease or oil leakage. To prevent corrosion, the propeller surfaces should be cleaned and waxed periodically with hard automotive paste wax.

8.4.6 OIL SYSTEM SERVICE

The oil tank capacity (each engine) is 3.35 U.S. gallons (12.7 LTS) and usable oil is 1.25 U.S. gallons (4.7 LTS). Oil system servicing consists of: oil level check, oil top up, chip detector continuity check, oil filter cleaning and oil filter changing.
For oil filter cleaning or changing refer to Pratt and Whitney Maintenance Manual P/N 3036122.
When adding oil, service the engine with the type and brand which is currently being used in the engine. Refer to engine log book.

CAUTION

Do not mix different brands viscosities or types of oil when performing oil top up. Should different brands of oil become mixed, drain and flush oil system and refill with fresh oil (refer to Pratt and Whitney Maintenance Manual P/N 3036122).

OIL LEVEL CHECK

To check oil level proceed as follows:

NOTE

Perform the oil level check within 10 minutes after engine shutdown.

1. Open ground test/refueling panel access door.
2. Set the GROUND TEST switch to LAMP position.
   L ENG OIL and R ENG OIL annunciators are ON.
3. Set the GROUND TEST switch to SYST position and hold.
   L ENG OIL and R ENG OIL annunciators are ON.
4. Release the GROUND TEST switch.
   L ENG OIL and R ENG OIL annunciators are OFF.

NOTE

Engine low level condition is indicated by the relative annunciator lamp ON.

CAUTION

On the airplanes equipped with the upgraded ground test/refuel panel, P/N 727-0439/02 (installed with Mod. No. 80-0467 or SB No. 80-0194), a real chip detection condition occurs, in the related engine oil, if the L ENG OIL or R ENG OIL annunciator light is flashing (3 Hz rate, 40% on and 60% off) while the GROUND TEST switch is held in the SYST position. Have an immediate maintenance check as per the applicable Engine Manual.

OIL TOP UP

To top up oil of the affected engine proceed as follows:
1. Open engine nacelle access door.
2. Unlock and remove filler cap and indicator assembly from filler neck.
3. Check oil tank contents against markings on dipstick (markings correspond to U.S. quart/ liters) and service as required.
4. Fill the oil tank to normal level using an appropriate oil servicing unit and record quantity of oil added to system.
5. Install filler cap and indicator assembly ensuring cap is locked securely.
6. Close all access openings.

8.4.7 FUEL SYSTEM SERVICE

Service fuel system after each flight.
Keep full to retard condensation in the tanks.
The total system capacity is reported in Section 2, par. 2.13, "Fuel Quantity Limitations".

FUEL REQUIREMENTS

JP-4, JP-8, commercial kerosene, Jet A, A-1 and B fuels conforming to the latest revision of Pratt & Whitney Service Bulletin No. 14004.
It is not necessary to purge the unused fuel from the system when switching fuel types.
The use of aviation gasoline is not permitted.

The operation of the aircraft requires the use of anti-icing additive in the fuel. The anti-icing additive must meet the latest revision of Pratt & Whitney Canada Service Bulletin No. 14004 (including Phillips PFA 55 MB, MIL-I-27686D and MIL-I-27686E) and must be blended with the fuel while refueling in the event the used fuel has no anti-icing additive blended at the rafinery.

A minimum anti-icing additive concentration of 0.06% by volume and a maximum concentration of 0.15% by volume must be used. When using the recommended anti-icing blending procedure (gravity refueling only) the additive concentration in the fuel shall be approximately 0.09% by volume. A blender supplied by the additive manufacturer should be used.

The additive manufacturer blending procedure has to be followed, providing to use not less than 0.8 fluid ounces of additive per 10 US Gallons of fuel nor more than 1.9 fluid ounces of additive per 10 US Gallons of fuel.

The refueling rate shall be in accordance with the additive manufacturer procedure providing the above mentioned concentration are guaranteed. To guarantee the mentioned concentrations, the additive temperature should be higer than 40°F.

FILLING THE SYSTEM

The airplane may be filled through a single-point gravity filler, located in the top of fuselage right side at wing-to-fuselage attachment, or through a single-point pressure filler located close to the ground test refueling panel recess (fuselage right side).

To fill the airplane observe all required safety precautions for handling aviation fuels, ground, proper fuels, etc.

WARNING

Fuel additive may be harmful if inhaled or swallowed. Use adequate ventilation. Avoid contact with skin and eyes. If sprayed into eyes, flush with large amount of water and contact a physician immediately.

A. Single-point Gravity Filling:

CAUTION

Assure that the additive is directed into the flowing fuel stream. The additive flow should start after and stop before the fuel flow. Do not permit the concentrated additive to come in contact with the aircraft painted surfaces.

Some fuels have anti-icing additives preblended in the fuel at the refinery, so no further blending should be performed.

1. Open the ground test/refueling panel.
2. Set REFUEL switch to OPEN position.
3. TK INTCON INT annunciator momentary comes on then goes off.
4. Verify TANK INTCON annunciator is on.
5. Remove filler cap and fill the airplane through the filler neck.
6. Reinstall filler cap and set the REFUEL switch to CLOSED position. Insure TK INTCON INT and TANK INTCON annunciators are OFF.

B. Single-point Pressure Filling:

CAUTION

Single point pressure refueling must be performed only with fuel having anti-icing blended at the refinery or using a truck having the possibility to blend the anti-icing additive with the fuel during the refueling operation.

NOTE

A minimum truck delivery pressure of 20 PSIG at the nozzle is required for satisfactory system performance.
Do not exceed maximum truck delivery pressure of 60 PSIG.

1. Open the ground test/refueling panel and the single-point filler access doors.
2. Set the GROUND TEST switch to LAMP position.
3. Verify TANK INTCON and TK INTCON INT annunciators are ON. Release GROUND TEST switch.
4. Set the REFUEL switch to OPEN position.
5. Verify TK INTCON INT annunciator momentary comes on then goes off and TANK INTCON is on.
6. Remove refuel adapter cap and connect refueling nozzle to refuel adapter.
7. Apply refueling pressure, on ground test refueling panel, set the GROUND TEST switch to SYST position and verify a fuel flow stop.

NOTE

If the fuel flow doesn't stop and it is intended to fill completely the tanks, complete the refueling procedure checking visually the fuel level from the gravity filler cap.

8. Release GROUND TEST switch: normal refuel flow is restored and continue to flow till to have system full.
9. When fuel flow stops disconnect refueling nozzle from refuel adapter and install refuel adapter cap.
10. Set the REFUEL switch to CLOSED position. Insure TK INTCON INT and TANK INTCON annunciators are off.
11. Close ground test refueling panel access door.

CHECKING FUEL ADDITIVE

Prolonged storage of the aircraft will result in water buildup in the fuel which "leaches out" the additive. This is indicated when an excessive amount of water accumulates in the fuel sump. Check the additive concentration using a Differential Refractometer. Follow the Technical Manual instructions of the differential Refractometer when checking the additive concentration.

Minimum additive concentration shall be 0.035% by volume and the maximum concentration shall be 0.15% by volume.

A suggested refractometer is the B/2 HAND REFRACTOMETER manufactured by Cambridge Instrument Inc., BUFFALO N.Y.

Contact PIAGGIO PRODUCT SUPPORT for more information and availability of the above refractometer or equivalent.

DRAINING CONTAMINANTS FROM FUEL SYSTEM

To facilitate draining the fuel system filter bowls, vent lines and fuel tank sumps of moisture and foreign matter drains are incorporated.

1. To drain the fuel filters OPEN the fuel firewall shutoff valves, switch ON the fuel pump (either MAIN or STBY) and operate the drain valve located on the underside of the nacelles using the draining tool P/N 80-909172-801 or equivalent. When drainage has finished, switch OFF the fuel pump.
2. To drain the fuel vent system operate the drain valves located on the left and right sides of fuselage beneath wing-to-fuselage attachment, using the draining tool P/N 80-909172-801 or equivalent.
3. To drain fuel tank sumps operate the drain valve located on left and right main gear wells respectively.

NOTE

It is recommended, as a general rule, that at each fuel drain fuel be collected and examined in a clear container, so that it can be visually checked for water and sediments.

WARNING

When draining any amount of fuel, be sure that no fire hazard exists before starting engines. Do not allow fuel to come in contact with the tires.

8.4.8 BATTERY SERVICE

The battery used in P.180 AVANTI is a rechargeable, vented, sintered plate, nickel-cadmium battery. There are 20 nylon encased cells housed in a stainless steel battery box. The electrolyte is composed of a 30 percent solution of potassium hydroxide in distilled water. During operation, no appreciable chemical change occurs in the electrolyte; therefore, testing the specific gravity of the electrolyte can not determine the state of charge. For servicing and cleaning instructions, refer to airplane Maintenance Manual.

WARNING

Servicing the battery requires special training, tools, and equipment. Improper handling can result in serious bodily injury or damage to the airplane. The electrolyte used is potassium hydroxide (KOH), which is a caustic chemical agent and serious burns will result if it comes in contact with the skin. If spilled on skin or clothing, neutralize with vinegar o a mild boric acid solution, or, if these are not available, wash thoroughly with water. Should the electrolyte come in contact with the eyes, flush thoroughly with running water and secure immediate medical attention. Shorted batteries can deliver high currents and a spark can cause a cell to explode. Metal articles, such as jewelry, can fuse to intercell straps causing serious injury. Bodily injury and equipment damage may result if acid or tools contaminated with acid are used. Water or electrolyte spilled into the battery container may cause corrosion and battery failure. Personnel qualified to service the battery should refer to the airplane Maintenance Manual.

8.4.9 OXYGEN SYSTEM SERVICE

NOTE

MIL-O-27210 Aviators Breathing Oxygen must be used for filling the system.

The filler valve for the oxygen cylinder is located on a recess part of the aft section of the cabin door coaming.
To charge the oxygen system, remove the protective cap from the filler valve and attach the fitting from an oxygen cart.

WARNING

Inspect the filler connection for cleanliness before attaching it to the filler valve. Be sure hands, tools and clothing are very clean and free from grease and oil since these contaminants will ignite when in contact with pure oxygen under pressure.

Open the cylinder supply valve on the airplane and fill the system slowly by adjusting the recharge rate with the pressure regulating valve on the cart. When the pressure on the cylinder reads 1850 psi at 70°F, close the pressure regulating valve and replace the protective cap on the filler valve.

OXYGEN SERVICING CHART

Ambient Temperature Degrees Fahrenheit	After Cooling Pressure Static	* Filling Pressure For 1850 PSI At 70°
0	1550	1650
10	1600	1700
20	1640	1725
30	1690	1775
40	1710	1825
50	1760	1875
60	1800	1925
70	1850	1975
80	1900	2000
90	1950	2050
100	2000	2100
110	2035	2150
120	2080	2200
130	2130	2250

* This column assumes about a 25 degree rise in temperature due to the heat of compression, and it assumes that the cylinders are being filled at their maximum rate.

Crew oxygen masks are of the permanent type and can be cleaned by the following procedure:

1. Remove the microphone from the mask.
2. Remove the sponge rubber discs from the mask. Do not use soap to clean sponge rubber parts, as this may deteriorate the rubber and give off unpleasant odors. Clean sponge rubber parts in clear water and squeeze dry.
3. Wash the rest of the mask in a very mild soap and water solution.
4. Rinse mask thoroughly to remove all traces of soap.
5. Allow components to dry thoroughly before reassembling. Do not allow sides of the breathing bag to stick together while drying.
6. The mask can be sterilized with a 70 percent ethyl alcohol solution.

8.4.10 ENVIRONMENTAL CONTROL SYSTEM

The environmental control system operates in conjunction with the airplane engines and provides air for airplane cabin compartment heating or cooling.
Servicing of system consists of periodical A.C.M. oil level top up and water separator filter element cleaning.

ACM OIL LEVEL TOP UP

To perform an ACM oil level top up proceed as follows:

1. Remove baggage compartment center floor panel to gain access to oil filler cap.
2. Remove oil filler plug.
3. On the bottom of fuselage at frame 77.90 locate the ACM overfill drain valve and using a philips screw driver open the valve.
4. Fill with oil Exxon 2380 till to have an overfill from drain valve.

NOTE

In the event the preferred Exxon oil is not available, any oil conforming to Military Specification MIL-L-23699 may be used. In the event neither of the above oil groups are available oil conforming to Military Specification MIL-L-7808G (or later) may be used as a suitable substitute.

5. Allow few seconds to have a complete drain of overflow.
6. Close the drain valve, reinstall filler cap and baggage compartment floor panel.

For filter element cleaning and further information refer to airplane Maintenance Manual.

8.4.11 PRESSURIZATION SYSTEM

The system embodies a self-test facility to perform periodically a system functional check.
To perform this check proceed as follows:

1. Insure airplane is resting on wheels.
2. Start both engines and set power levers to IDLE position and condition levers to G.I.
3. Insure DUMP switch guard is in place.
4. Set rate selection knob (R) to "PIP" mark.
5. Insure cabin altitude selection (A) is not selected off the usable scale.
6. Insure barometric correction (B) is not selected off the usable scale.
7. Set AUTO-MAN switch first to MAN position then to AUTO position.
8. Observe cabin pressure selector fault indication lamp. The lamp will illuminate momentarily (3 sec. or less) and then extinguish.
   If the fault indicator light remains illuminated for longer than 3 seconds a malfunction has been detected by the system.

Should the operational check show any malfunction of the pressurization system, the Maintenance Manual must be consulted for service instructions and any maintenance or adjustments required to make the system operational.

8.4.12 LUBRICATION

Refer to the airplane Maintenance Manual for lubricating instructions, chart showing lubrication points, types of lubricants to be used, and lubrication methods.

8.4.13 CLEANING

a) Cleaning Engine Compartment

Operating conditions and environment dictate the frequency and methods to be observed in cleaning the airplanesengines.Saltairandairborne'pollution, for example, leave corrosive deposits which must be washed from the engine before they are allowed to accumulate.

For engine cleaning procedures, refer to and comply with the Pratt and Whitney PT6A-66 Maintenance Manual.

b) Cleaning Landing Gear

Before cleaning the landing gear, place a cover of plastic or a similar waterproof material over the wheel and brake assembly.

1) Place a pan under the gear to catch waste.
2) Spray or brush the gear with solvent or a mixture of solvent and degreaser. To remove especially heavy dirt and grease deposits, it may be necessary to brush areas that where sprayed.
3) Allow the solvent to remain on the gear from five to ten minutes. Then rinse the gear with additional solvent and allow it to dry.
4) Remove the protective cover and the catch pan.
5) Lubricate the gear in accordance with the Lubrication Chart of the Maintenance Manual.

c) Cleaning Exterior Surfaces

The airplane should be washed with a mild soap and water solution. Harsh abrasives or alkaline soaps or detergents could scratch painted or plastic surfaces or corrode metal. Cover areas where a cleaning solution could cause damage. To wash the airplane use the following procedure:

1) Flush away loose dirt with water.
2) Apply cleaning solution with a soft cloth, a sponge, or a soft brush.
3) To remove stubborn oil and grease stains, use a soft cloth dampened with naphtha.
4) Rinse all surfaces thoroughly.
5) Any good automotive wax may be used to protect and preserve painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing. A heavier coat of wax on leading surfaces will reduce the abrasion problems in these areas.

d) Cleaning Windshield and Windows

1) Remove dirt, mud, and other loose particles from exterior surfaces with clean water or with a 50% isopropyl alcohol. If adhered particles are present they should be removed with the bare hands before any cloth is rubbed over the surface.
2) Wash interior and exterior windows surfaces with mild soap and warm water. Use a soft cloth or sponge in a straight rubbing motion. Do not use any abrasive materials or any strong acids or bases.
3) Rinse thoroughly with clean water and dry. Application of a rain repellant such as REPCON every 25 flight hours or 10 days is recommended to enhance water shedding.

4) Rinse windows thoroughly and dry with soft lint-free cloth.

CAUTION

Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone, other strong solvents, or window cleaning sprays. Do not use plastic cleaner on heated glass windshields.

5) A superficial scratch or mar in plastic can be removed by polishing out the scratch with jeweler's rouge.
6) When windows are clean, apply a thin coat of hand polishing wax. Rub lightly with a soft cloth.

e) Cleaning Surface Deicing Equipment

Nacelle air intake lip deice boots should be cleaned when the aircraft is washed using a mild soap and water solution.

In cold weather, wash the boots with the airplane inside a warm hangar if possible. If the cleaning is to be done outdoors, heat the soap and water solution taking it out to the airplane. If difficulty is encountered with the water freezing on boots, direct a flow of warm air along the region being cleaned, using a portable type ground heater.

As an alternate cleaning solvent, use benzol or nonleaded gasoline. Moisten the cleaning cloth in the solvent, scrub lightly, and then, with a clean, dry cloth, wipe dry so that the cleaner has not time to soak into the rubber.

CAUTION

Petroleum products such as these are injurious to rubber, and therefore should be used sparingly if at all.

When deice boots are clean, a coating of B.F. Goodrich Icex should be applied. Icex is compounded to lower the strength of adhesion between ice and rubber surface of the deice boots.

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SECTION 9

SUPPLEMENTS

9.0 GENERAL

This section provides information in the form of supplements which are necessary for efficient operation of the airplane when it is equipped with one or more of the various optional systems and equipment not provided with the standard airplane.

All of the supplements provided in this section are consecutively numbered as a permanent part of this handbook. The information contained in each supplement applies only when the related equipment is installed in the airplane.

9.1 OPTIONAL SUPPLEMENTS

The standard issue of the Pilot's Operating Handbook and Airplane Flight Manual does not contain Optional Supplements that will be supplied only on the basis of a specific customer request.

However, these Supplements will be numbered and listed in Section 9 "Table of Contents" and the related page range reserved for embodiment at the time of the specific Supplement issue.

Each customer will update the Section 0 "Record of Embodiment/Removal" Table, following the embodiment of an Optional Supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 1 FOR THE COLLINS APS-65 AUTOPILOT AND FLIGHT CONTROL SYSTEM AND THE ADI-84, AND EHSI-74 FLIGHT INSTRUMENTS

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Collins APS-65 Digital Flight Control System is installed. The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The Collins APS-65 Digital Flight Control System is a fully integrated three axis flight control system. Roll and pitch information are provided to the autopilot and attitude director indicator (ADI) from a vertical gyro. Yaw information is provided from a yaw rate gyro. Steering commands for the flight director are provided by the autopilot computer as are the commands to the autopilot servos when the autopilot is engaged.

The autopilot computer also provides electric trim capability. With the autopilot engaged, the system provides automatic pitch trim to relieve elevator forces. Dual function trim switches are mounted on the control wheels to provide manual electric trim and modification to the flight director command. To reduce the possibility of inadvertent trim activation, the arming button on top of the control wheel trim switch must be pressed to command manual electric trim motion.

This supplement includes description of the ADI-84 Attitude Director Indicator, the EHSI-74 Electronic Horizontal Situation Indicator and the 5506 Altitude Alerter. If the APS-65 Flight Control System is installed with other flight instrument systems, refer to the appropriate supplements for operation of those instruments.

ABBREVIATIONS

ADI	Attitude Director Indicator
ALS	Altitude Preselect Mode
ALT	Altitude Hold Mode
ALTS	Altitude Preselect Mode
AP	Autopilot
AP SYNC	Flight Control System Synchronization
APR	Approach Mode
ARM	System Ready for Automatic Capture (NAV, APR, G/S or ALTS)
B/C	Back-Course Mode
BRG	Bearing
CLM	Climb Mode
CRS	Course
DH	Decision Height
DIS	Disengaged (Autopilot or Yaw Damper)
DME	Distance Measuring Equipment
DR	Dead Reckoning Mode
DSC	Descent Mode
EHSI	Electronic Horizontal Situation Indicator
ENG	Engaged (Autopilot or Yaw Damper)
FD	Flight Director
GA	Go-Around Mode
GLS	Glide Slope
G/S	Glide Slope Mode
HCP	Heading Course Panel
HDG	Heading Mode
HSI	Horizontal Situation Indicator Mode
IAS	Indicated Airspeed Hold Mode
ILS	Instrument Landing System
INT	Intensity
MSW	Control Wheel Master Switch
NAV	Navigation Mode
NV	Navigation Source
SFT	Soft Ride Mode
SPD	Speed Hold Mode (IAS/Mach)
TTG	Time-To-Go
VS	Vertical Speed Hold Mode
YD	Yaw Damper
1/2 Φ	Half (Reduced) Bank Angle Mode

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SECTION 2 – LIMITATIONS

a) During autopilot and flight director operation, the pilot must be seated at the controls with seat belt fastened.
b) The autopilot is certified for Category I - ILS Approaches.
c) Autopilot and yaw damper must be disengaged during takeoff and landing.
d) Manual electric trim system PREFLIGHT CHECK must be satisfactorily accomplished prior to the flight.
e) Do not engage the autopilot if the airplane is out of trim.
f) Maximum speed for autopilot operation is V_{MO}/M_{MO}.
g) Minimum speed for autopilot operation is stall warning speed.
h) Minimum speed for autopilot operation during single engine flight is stall warning speed.
i) Maximum altitude for autopilot operation is 41,000 ft pressure altitude.
j) Minimum altitude for autopilot/yaw damper operation is:

1000 ft (cruise and descent)
200 ft (climb after takeoff)
200 ft (approach - normal or single engine)

k) Do not override the autopilot to change pitch attitude.
l) VOR coupled approaches must be conducted in the APR mode.

SECTION 3 – EMERGENCY PROCEDURES

EMERGENCY PROCEDURES CHECKLIST

AUTOPILOT MISSING DISENGAGEMENT

a) Control Wheel/Rudder Pedals - HOLD firmly and OVERPOWER if necessary
b) MSW Button - DEPRESS and HOLD
c) Longitudinal trim switch (pedestal) - SEC
d) Secondary pitch trim control - OPERATE as necessary to reduce control forces
e) MSW Button - RELEASE

if necessary:
f) AUTOPILOT circuit breaker - PULL

if flight director operation is desired:
g) AP SERVOS circuit breaker - PULL
h) AUTOPILOT circuit breaker - RESET

AUTOPILOT SERVO HARDOVER

a) Control Wheel/Rudder Pedals - OVERPOWER to prevent further deviation
b) MSW Button - DEPRESS (and HOLD if autopilot fails to disengage)
c) AP SERVOS circuit breaker - PULL

WARNING

Do not attempt to re-engage the autopilot following an autopilot servo hardover.

AUTOPILOT AUTOTRIM MALFUNCTION

a) Control wheel - HOLD firmly to prevent further deviation
b) MSW Button - DEPRESS
c) SEC PITCH circuit breaker - PULL

WARNING

Do not attempt to re-engage the autopilot following an autopilot/ autotrim malfunction.

ENGINE FAILURE DURING AUTOPILOT OPERATION

a) Control Wheel/Rudder Pedals - HOLD firmly to prevent further deviation
b) MSW Button - DEPRESS
c) Engine Securing Procedure - ACCOMPLISH per Emergency Procedures Section of AFM/ POH.
d) Aileron/Rudder Trim - MANUALLY RETRIM
e) Autopilot - RE-ENGAGE
f) Autopilot Modes - RESELECT AS DESIRED

NOTE

Large power changes during single engine operations may require disengaging the autopilot and retrimming the airplane prior to resuming autopilot operation.

PRIMARY INVERTER FAILURE

In case of primary inverter failure, the autopilot will automatically disconnect.

a) Autopilot - RE-ENGAGE

AMPLIFIED EMERGENCY PROCEDURES

The following paragraphs are presented to supply additional information for the purpose of providing the pilot with a more complete understanding of the recommended course of action and probable cause of an emergency situation.

a) The autopilot can be disengaged by any of the following methods:

1) Push the MSW button on pilot's or copilot's control wheel.
2) Push the AP ENG switch on the autopilot control panel.
3) Put the trim selector switch in the OFF or SECONDARY trim position.
4) Operate the trim switch on the outboard side of the pilot's or copilot's control wheel.
5) Pull the AP SERVOS or the AUTOPILOT circuit breaker (copilot's CB panel) or the SEC PITCH circuit breaker (pilot's CB panel).

The most effective method for disengaging the autopilot is pressing the MSW button until disengagement is recognized by the pilot. However, if upon releasing the MSW button the controls are still loaded (like the autopilot has not disengaged) press and hold the MSW button to fully unload the controls. Then setting the longitudinal trim switch to SEC, longitudinal trimming is allowed with the secondary control (pedestal).
If necessary, the pilot can pull the AUTOPILOT (or AP SERVOS, if flight director operation is desired) circuit breaker on the copilot's circuit breaker panel.

b) The following conditions will cause the autopilot to disengage automatically:

1) Any major degradation, interruption or failure of input electrical power.
2) Detection of a failure in the autopilot computer (APC-65A) by the internal monitor.
3) Loss of vertical gyro monitor or air data monitor.
4) Roll attitudes in excess of approximately 45 degrees and/or pitch attitudes in excess of approximately 30 degrees.
5) Indicated airspeed below stall warning speed or with the stall warning activated for more than 1 sec.
6) Any major difference in indicated airspeed between the left and right pitot/static system: only for Air Data Sensor (ADS-65) installed with pneumatic instruments.

c) The yaw damper can be disconnected by any of the following methods:

1) Push the MSW button on pilot's or copilot's control wheel.
2) Push the YD ENG switch on the autopilot control panel.
3) Pull the AUTOPILOT circuit breaker on the copilot's breaker panel.

d) The following conditions will cause the yaw damper to disengage automatically:

1) Detection of a failure in the APC-65A by the internal monitor.
2) Any major degradation, interruption or failure of input electrical power.

e) In the unlikely event of any servo becoming mechanically jammed, control of the airplane can still be maintained by overpowering the servo capstan slip clutch. The maximum overpower forces on the controls are as follows:

Roll	12 lbs
Yaw	60 lbs
Pitch	45 lbs

NOTE

The pitch force represents the initial overpower force of the pitch servo. After approximately 2 seconds, the autotrim system will run in a direction to oppose the overpower force, thereby increasing the overpower force as a function of time and airspeed: for this reason it is imperative to disengage the autopilot as soon as a malfunction is detected.

AUTOPILOT SERVO HARDOVER

An autopilot servo hardover occurs when a servo runs without being commanded to do so. This type of malfunction is recognizable by the airplane deviating from a preprogrammed flight path in either pitch, roll or yaw depending on which servo malfunctioned.

Should this type of malfunction be observed or suspected, immediately grasp the control wheel and disconnect the autopilot with the MSW button on the yoke, then pull the AP SERVOS circuit breaker located on the copilot panel.

WARNING

Do not attempt to re-engage the autopilot following an autopilot servo hardover.

The APS 65 autopilot incorporates internal monitors in the roll and pitch axes which will automatically disengage the autopilot if the roll angle exceeds ± 45° or pitch exceeds ± 30°.

If the roll rate exceeds 8 deg/s, or the pitch rate exceeds 3 deg/s, or the acceleration exceeds a 0.5 "g" change, a rate monitor will remove the torque from the servo until the rate or the load factor are below those estabilished limit before re-applying the torque.

AUTOPILOT AUTOTRIM MALFUNCTION

An autotrim malfunction is extremely improbable. However, if the pilot observes a steady illumination of the red TRIM light an autotrim malfunction may have occurred. An autopilot autotrim malfunction occurs when the elevator trim servo runs uncommanded or a malfunction is detected in the trim system with the autopilot engaged. Built in trim monitors will disengage the autopilot any time uncommanded trim motion is detected. The airplane initially will not deviate from the selected vertical mode as the elevator servo compensates for the out of trim condition until the trim forces overpower it. If any of the above indications are observed, hold the control wheel firmly to prevent pitch excursions, and disconnect the autopilot with the MSW button, then pull the SEC PITCH circuit breaker located on the pilot circuit breaker panel.

To retrim, if necessary, the airplane, only the primary pitch trim should be used.

WARNING

Do not attempt to re-engage the autopilot following an autopilot/ autotrim malfunction.

ENGINE FAILURE DURING AUTOPILOT OPERATION

If an engine failure occurs while the autopilot is engaged, disengage the autopilot pushing the MSW button and accomplish the Engine Securing Procedure as explained in the Emergency Procedure Section of this AFM/POH. Following engine securing, the aileron and rudder trim should be manually readjusted and the autopilot may be re-engaged. Use of the "1/2 Φ" (1/2 bank angle) during single engine operation may be used to reduce the autopilot roll authority. All autopilot modes are usable during single engine operation.

NOTE

Large power change during single engine operations may require disengaging the autopilot and retrimming the airplane prior to resuming autopilot operation.

PRIMARY INVERTER FAILURE

In case of a primary inverter failure, the autopilot will automatically disconnect. However, as all the utilities on primary inverter will automatically switch to the secondary inverter, the autopilot can be re-engaged and all modes can be used.

SECTION 4 – NORMAL PROCEDURES

NORMAL PROCEDURES CHECK LIST

AUTOPILOT PREFLIGHT AND FUNCTIONAL CHECKS

a) Battery Switch - CHECK BAT
b) Circuit Breakers - CHECK
c) Trim Systems - TEST in accordance to Section 4 of this AFM/POH.
d) Inverter Switches - select PRI and SEC
e) Avionics Switch - ON
f) Attitude Gyro - CHECK Attitude and Autopilot Computer flags out of view
g) Horizontal Situation Indicator - CHECK heading flag out of view

NOTE

Attitude gyros, autopilot/flight guidance computer and compass systems flags may have different legends depending upon installed flight instruments. Refer to the appropriate decription sections for further details.

h) Autopilot Engage Button - PUSH and check ON YD and AP lights; DIS lights will flash momentarily, then OFF
i) MSW button - PRESS
j) Autopilot Control system Preflight Test - ACCOMPLISH
Push and release TEST button on Autopilot Controller Panel to check annunciator operation. Rudder pedals will move. The GA green annunciation only will remain illuminated indicating that the AP is in Ground Test mode. Depress the TEST button to put it back in the normal mode; re-engage the autopilot.
k) Autopilot Overpower Forces - Check all three axis
l) Heading Mode Checks - ACCOMPLISH
   1) Engage Heading Mode
   2) Position heading marker 10° left of lubber line
   3) Verify that the command bars indicate a left turn and that the control wheel turns to the left.
   4) Repeat check to the right.
m) Autotrim Checks - ACCOMPLISH
   1) Apply back pressure to the control wheel.
   2) Verify that the elevator trim indicator moves nose down after approximately 2 seconds.
   3) Repeat check with forward pressure, and check that the trim indicator moves nose up.
n) Approach Mode Checks - ACCOMPLISH
   1) Tune the No. 1 VOR receiver to an active VOR frequency.
   2) Center the lateral deviation bar.
   3) Engage Approach Mode.
   4) Verify that the command bars turn in the direction of the course and the control wheel turns to satisfy the command.
o) AP SYNC Switch Operation Checks - ACCOMPLISH
   1) Depress the AP SYNC switch located on the pilot's control wheel.
   2) Verify that the control wheel is free to move in pitch and roll without having to overpower the autopilot and check DIS light ON.
   3) Release the AP SYNC switch and verify that the autopilot has to be overridden to move the controls.

p) Autopilot Disengagement Checks - ACCOMPLISH
Verify that each of the following actions will disengage the autopilot:
1) Depressing MSW button (yaw damper also disengages)
2) Activating Manual Electric Trim
3) Depressing AP ENG Button on the Autopilot Controller Panel
4) Trim Selector in the OFF or SEC position.

q) Aircraft Flight Controls - CHECK free and correct

r) Elevator Trim - SET for takeoff

TAKEOFF/CLIMB

a) Autopilot - DISENGAGE

b) Flight Director - SELECT desired modes.

c) Autopilot - ENGAGE above 200 feet if desired.

CRUISE/DESCENT

a) Above 1000 feet AGL - ENGAGE autopilot if desired.

b) Modes - SELECT as desired.

APPROACH

a) Approach modes - COUPLED if desired

b) 200 feet AGL - DISENGAGE autopilot

NOTE

VOR approaches must be conducted in APR mode.

GO AROUND

a. GA button - PUSH. If autopilot engaged GA will be coupled

NOTE

The GA button is located on the left power lever (on the right one on the airplanes S.N. 1004 to 1021 without S.B. 80-0040).

b. Power Levers - Apply balked landing climb power as per Figure 5-70 (page 5-77 at Section 5 of this AFM/POH)

AMPLIFIED NORMAL PROCEDURES

The following information is provided to supply a detailed description and explanation of the normal procedures necessary for the operation of the flight control system.

NOTE

If the V-bars are in view and no FD mode is selected, to remove V-bars out of view select and then deselect a lateral mode.

AUTOPILOT PREFLIGHT AND FUNCTIONAL TEST

The autopilot preflight and functional checks should be conducted before each flight to assure proper operation. The battery switch should be on, the circuit breakers checked, inverter power and avionics must be on, the vertical gyro erect (attitude, compass and autopilot computer flags out of view) before accomplishing the preflight checks.

NOTE

Attitude gyros, autopilot/flight guidance computer and compass systems flags may have different legends depending upon installed flight instruments. Refer to the appropriate decription sections for further details.

Depressing the autopilot engage button activates an internal test sequence within the autopilot computer which must be completed satisfactorily before the autopilot will engage. Unsatisfactory test will be shown by central AP red light on the autopilot panel and the two central DIS amber lights will be flashing.

The TEST button on the Autopilot Controller Panel should be pressed to check all autopilot annunciator lights for proper operation. After engaging the autopilot, the pilot should check to see that the controls in all three axes can be overpowered.

By engaging the HDG on the Autopilot Controller Panel, the Flight Director Command bars will drop into sight on the pilot's ADI. The heading bug should be centered below the lubber line on the pilot's EHSI. This will result in a wings level display by the command bars. By rotating the heading marker 10° left and right of the lubber line, the flight director will display left and right turns accordingly. The autopilot will also follow these commands resulting in the control wheel turning in the corresponding directions.

Autotrim checks should be accomplished by manually pulling back on the control wheel and verifying that the trim runs automatically (approximately after 2 seconds) in the nose down direction as the autopilot attempts to relieve the load imposed by the pilot. Pushing forward on the control wheel will result in the trim running nose up for the same reason.

The APR Mode checks are accomplished with the No. 1 VOR tuned to an active VOR frequency for a station which is within receiving range. Center the lateral deviation bar on the pilot's EHSI; displace it on right or left and confirm that the flight director displays a turn in the direction of the course indicated by the EHSI and that the autopilot attempts to follow the command by turning the control wheel in the direction of the course.

The AP SYNC switch located on the pilot's control wheel should be checked to verify that when depressed, the autopilot servos are disconnected from the autopilot to allow the airplane to be hand flown for minor course corrections without disengaging the autopilot. The AP "DIS" will flash on the annun-

ciator panel for 5 to 7 seconds and then will extinguish. When the AP SYNC switch is released, the autopilot will re-engage. Without the AP SYNC switch being depressed, the autopilot must be disengaged to hand fly the airplane.

During ground check, depress the MSW button and verify that the autopilot and the yaw damper disengage. Re-engage the autopilot and verify that activating the control wheel manual electric trim switch will disengage the autopilot. Re-engage the autopilot and verify that by redepressing the engage button, the autopilot will disengage. Reengage the autopilot and verify that it will be disengaged by actuating the trim selector out of the PRI position.

Disengage the yaw damper and verify that all controls operate freely and in the correct direction. Set the trim to the takeoff position.

TAKEOFF/CLIMB

The autopilot must be off for takeoff. Flight Director Modes may be selected as desired by the pilot. With any lateral mode selected, the AP SYNC switch will synchronize the pitch commands to the attitude of the airplane at the time AP SYNC switch is released. The autopilot may be engaged above 200 feet during climb.

CRUISE/DESCENT

When cruising at 1000 feet AGL or above, the autopilot may be engaged if the airplane is trimmed, roll attitude is less than 45 deg and pitch attitude is less than 30 deg approximately. The existing pitch and roll attitudes will be maintained until lateral and vertical modes are selected. The heading bug should be aligned with the airplane heading or desired heading prior to selecting HDG Mode. The navigation radio should be tuned and the course arrow set to the desired VOR radial before selecting NAV.

Turning the altitude preselector knob always arms the ALTS mode. Before engaging CLM, SPD or VS select the desired altitude on the preselector, otherwise the mode will not engage.

CLM, SPD, VS may be used during climbout to maintain the desired vertical profile. The vertical trim switch may be used in Pitch Hold, CLM, SPD or VS to modify the climb profile.

When using ALTS, the autopilot will automatically capture the preselected altitude for level off. If another vertical mode is used for the climb and ALT is to be selected at the desired level off altitude, the best autopilot performance will be obtained by reducing the airplane's vertical speed to approximately 500 feet per minute before engaging ALT. Using the CLM, VS, DSC, SPD mode will automatically arm the ALTS mode, when the altitude indicated in the preselector is different from the airplane altitude.

To establish the airplane on a desired VOR radial, perform the following:

a) Tune the navigation receiver to the desired VOR frequency.
b) Set the course arrow on the EHSI to the desired VOR radial.
c) Set the heading bug on the EHSI to the desired intercept heading.
d) Press the NAV button on the Autopilot Controller Panel. The HDG and NAV ARM annunciators will light, indicating that the system is still in the heading mode and is armed for VOR radial capture.

With the above procedure completed, the flight control system maneuvers the airplane to fly the selected heading to the point of beam capture. At beam capture, the HDG and ARM annunciators extinguish and smooth turn and rollout on the VOR radial is initiated. For optimum autopilot performance, plan the VOR capture so the system maintains straight and level flight in the NAV ARM mode for a minimum of 30 seconds prior to capturing the VOR radial.

For optimum performance, conduct VOR intercepts at angles less than 60°.
After capture of the selected VOR radial, the system provides automatic crosswind correction for proper tracking of the radial. Bank angles are limited to ± 10° in the NAV mode.

When passing a VOR station, DR (Dead Reckoning) will be annunciated as the autopilot calculates the proper heading to fly to assure smooth station passage.

Outbound course change may be commanded when overflying the VOR station if the course change is ± 30° or less. Set the course arrow to the new outbound radial at the time the to-from arrow changes from inbound to outbound. The flight control system will maneuver the airplane to attain the new selected course, and station passage will be as described above.

To place the airplane directly on a VOR radial, select the NAV mode after the course indicator deviation bar indicates the width of one deviation bar or less. The system bypasses the ARM mode and switches directly to the NAV mode and begins to track the center of the beam.

DSC, SPD, VS may be used during descent to maintain the desired vertical profile. The vertical trim switch may be used in Pitch Hold, DSC, SPD or VS to modify the descent profile.

APPROACH

a) ILS Approaches
The localizer and glide slope are captured automatically on an ILS front-course approach. The localizer must be captured before glide slope capture can occur. The localizer is always captured from a selected heading, but the glide slope may be captured from any of the vertical modes. Perform a front-course approach as follows:

For optimum autopilot performance, limit localizer intercepts to angles less than 60° and airspeed below 200 KIAS. Plan the approach to intercept the localizer 5 to 10 NM outside the outer marker or final approach fix.

1) Tune the navigation receiver to the ILS frequency and set the course arrow to the published inbound course.
2) Set the heading bug to the desired intercept heading, and select HDG on the Autopilot Controller Panel. Any vertical mode may be selected during localizer intercept.
3) Select APR on the Autopilot Controller Panel to arm the system for automatic localizer and glide slope capture. The HDG and APR ARM annunciators illuminate to verify that proper switching has occurred.
4) As the airplane nears the center of the localizer, the HDG and APR ARM annunciators extinguish, the APR annunciator illuminates, and the localizer course is captured. When localizer capture occurs, the G/S ARM annunciator illuminates to verify that the system is armed for glide slope capture.

NOTE

As soon as localizer capture occurs (APR ARM switches to APR), the published missed approach heading may be set on the pilot's EHSI heading bug.

5) Before glide slope capture, the system remains in any vertical mode selected on the Autopilot Controller Panel. When the glide slope is captured, the G/S ARM annunciator extinguishes and the G/S annunciator illuminates. Any selected vertical mode automatically disengages at G/S capture. All steering commands (lateral and vertical) are to maintain the center of the localizer and glide slope.
6) Lateral and vertical slew switch has no effect after glideslope and localizer capture.

b) VOR Approaches
VOR approaches are accomplished in the same manner as ILS front course approaches except no glide slope signals are available.

NOTE

VOR approaches must be conducted in APR mode.

1) Tune No. 1 NAV to proper VOR or VORTAC frequency.
2) Set course pointer to published inbound course.
3) Set heading bug to desired intercept angle and select the HDG mode. For optimum performance, limit VOR intercepts to angles less than 60° and speeds at or below 200 KIAS.
4) Select APR on the Autopilot Controller Panel to arm the system for automatic VOR capture. The HDG and NAV ARM annunciators illuminate to verify that proper switching has occurred.
5) As the airplane nears the center of the selected radial, the HDG and NAV ARM annunciators extinguish and the NAV annunciator illuminates as the autopilot intercepts the selected course.
6) Adjust the vertical trim switch as desired, to descend in accordance with published instructions.
7) Go-Around and landing procedures are the same as for an ILS approach.

c) Back-Course Approaches
As in a front-course approach, the localizer is captured automatically. The glide slope circuits are automatically disengaged during a back-course approach. Perform a back-course approach as follows:

1) Tune the navigation receiver to the localizer frequency and set the course arrow to the published inbound front course. Note that the course arrow is always set to the front localizer course.
Select APR and B/C mode on the Autopilot Controller Panel.
2) To intercept the localizer for a back-course approach, set the heading marker to the desired intercept heading, and select HDG mode on the autopilot controller. Any vertical mode may be selected during localizer intercept.
3) Use the vertical trim switch on the control wheel to adjust the rate of descent. Go-Around selection and operation are the same as on a front-course approach.

d) Vectored Approaches
When a radar vectored approach is required, the pilot may use the flight control system to maintain the vector headings and altitudes. To fly a radar-vectored approach, first set the heading bug under the lubber line, then select HDG on the Autopilot Controller Panel. Maintain the vector heading received from approach control by setting the heading bug to the appropriate heading. The course arrow may be set to the runway heading being approached to provide a visual reference of runway position in relation to the aircraft heading. The desired vertical mode may be utilized to follow vertical commands during vectoring.

The autopilot and yaw damper must be disengaged prior to landing. Both functions may be cancelled simultaneously by depressing the MSW button.

GO-AROUND

Execute a Go-Around by the following procedure:

a) Press the GA button on the left power lever (right on the airplanes S.N. 1004 to 1021 without S.B. 80-0040) while increasing power to the balked landing climb power setting (Refer to Section 5 of this AFM/POH).

The GA mode can be selected only from the APR mode; if the autopilot is engaged, the GA mode will maneuver the aircraft to an approximately 8° nose up pitch attitude.
The APR Mode is cancelled, LVL and GA lights will illuminate and steering commands are provided for a wings level, fixed 8° pitch-up.

Selecting a lateral mode cancels the Go-Around mode. The pitch attitude will remain at that used for Go-Around until changed with the AP SYNC button or by the selection of a vertical mode.

b) After airplane cleanup, Go-Around power settings and airspeed are established, select the HDG or NAV mode on the Autopilot Controller Panel to fly the missed approach procedure.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 6 – WEIGHT AND BALANCE

Installation of the Collins APS-65 Digital Flight Control System is included in the weight and balance information presented in Section 6 of the Pilot's Operating Handbook.

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SECTION 7 – SYSTEM DESCRIPTION AND OPERATION

The Rockwell-Collins APS-65 Digital Autopilot is a three axis flight control system. Roll and pitch information is provided to the autopilot and attitude indication from a vertical gyro. This section includes descriptions of the ADI-84 (Attitude Director Indicator) and an EHSI-74 (Electronic Horizontal Situation Indicator).

A flight director is provided with steering command bars on the ADI to display computed bank and pitch commands for various flight profiles. The APC-65A Autopilot Computer is utilized to compute the flight director commands as well as computing the operational commands for the autopilot and monitoring the manual electric trim. The remaining autopilot components are the autopilot and flight control panel with annunciation lights, three servos for the pitch, roll and yaw axis, and the pitch trim actuator.

ATTITUDE DIRECTOR INDICATOR

NOTE

For installation on co-pilot instrument panel, steering command bars duplicate the information provided from AP Computer) to pilot V-bars. The two position switch "CMD BAR IN VIEW", "OUT OF VIEW", if installed above the ADI-84, will enable or disable command bars display.

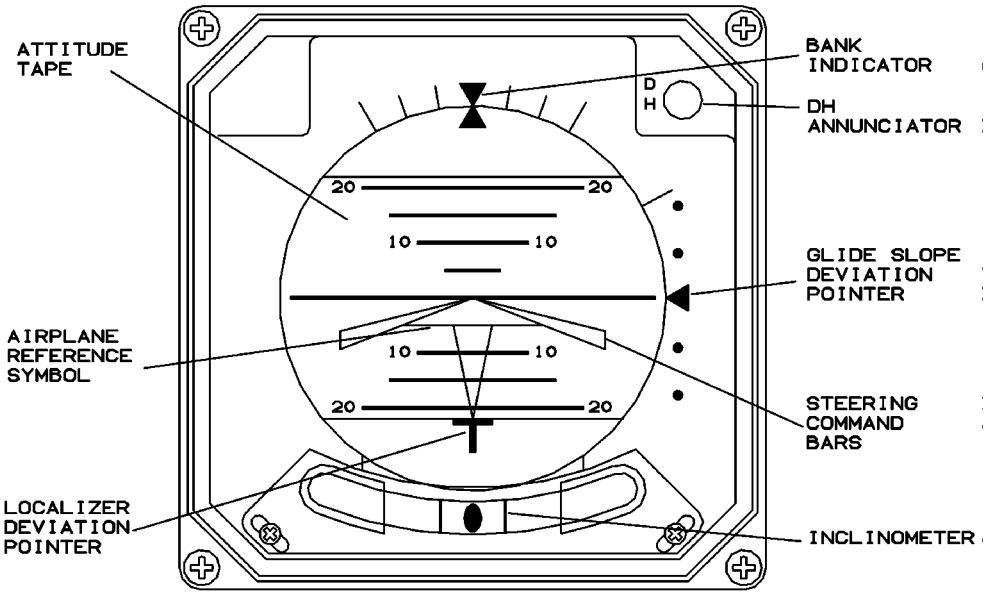

Figure 9-1. ADI-84 (ATTITUDE DIRECTOR INDICATOR)

AIRPLANE REFERENCE SYMBOL, ATTITUDE TAPE AND BANK INDICATOR

The airplane reference symbol represents the airplane. Pitch and roll attitude is displayed by the relationship of the airplane symbol and the movable attitude tape. White lines representing pitch attitude are shown on the attitude tape. The attitude tape is colored with a blue sky above and brown ground below, separated by a white horizon line. Bank indexes show 10, 20, 30 and 45 degrees right and left bank. A full 360 degree roll presentation about the horizon is possible. An attitude tape displays up to 90 degrees pitch-up or 90 degrees pitch-down attitude.

STEERING COMMAND BARS

The steering command bars display computed bank and pitch commands. The bars move up or down to command a climb or descent and roll clockwise or counterclockwise to command a right or left bank. The airplane is maneuvered so that the airplane symbol is "flown into" the command bars until the two are aligned to satisfy the commands. The command bars are deflected upward out of view when not in use.

GLIDE SLOPE DEVIATION POINTER AND SCALE

The glide slope deviation pointer represents the center of the glide slope beam and displays vertical displacement of the airplane from the beam centerline. The pointer is in view only when the navigation receiver is tuned to an ILS frequency. The center of the glide slope scale represents airplane position with respect to the glide path. The glide slope pointer presents a "fly to" indication.

RUNWAY SYMBOL AND LOCALIZER SCALE

The runway symbol represents the center of the localizer beam and moves laterally to display localizer deviation. It represents an expanded portion of the lateral deviation bar on the EHSI. The outside reference dots of the runway scale are equivalent to the inner dots on the EHSI. The runway symbol is out of view when the localizer signal is not valid or when a localizer frequency is not tuned.

INCLINOMETER

The inclinometer monitors airplane slip or skid, and is used as an aid to coordinate turns.

DECISION HEIGHT ANNUNCIATOR

The annunciator is used if a Radio Altimeter is installed.

EHSI-74 ELECTRONIC HORIZONTAL SITUATION INDICATOR

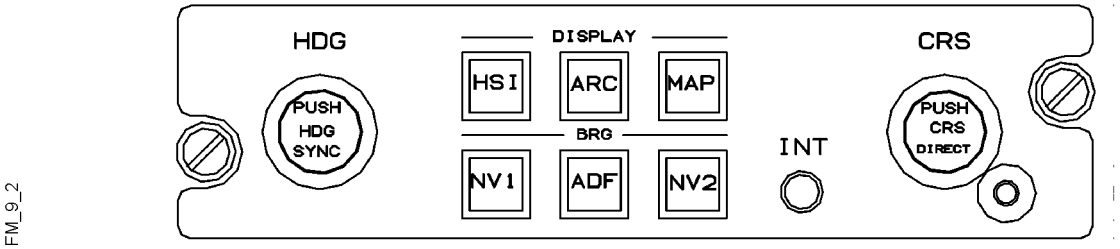

Figure 9-2. HCP-74 EHSI CONTROL PANEL

The EHSI Control Panel (HCP-74) provides the pilot with the necessary display controls for operation of the EHSI-74.

HEADING SELECT KNOB (HDG)

The Heading Select Knob controls the heading bug on the compass rose display of the EHSI when operating in any mode. Knob rotation provides for 1 degree increments of selected heading when turned slowly. Larger increments are provided with faster knob rotation.
Incorporated in the center of the HDG Knob is a HDG SYNC pushbutton switch which, when depressed, automatically centers the heading bug beneath the lubber line on the EHSI. This function occurs automatically when the navigation mode is changed (i.e., from VOR to ILS, etc.), but only when the autopilot is not in the HDG mode.

COURSE SELECT KNOB (CBS)

Rotation of the Course Select Knob causes the course arrow displayed on the EHSI to rotate in 1 degree increments when turned slowly. Larger increments are made when the course knob is rotated at a faster rate.

A CRS DIRECT pushbutton switch is located in the center of the CRS Knob which, when depressed, results in the course arrow being slewed directly to the TO course which centers the course deviation bar.

DISPLAY FORMAT SELECTION

The HSI, ARC, and MAP buttons provide control of the display formats presented on the EHSI. In the HSI mode, the full compass rose is displayed on the EHSI. The ARC mode provides an expanded compass sector which displays an arc extending approximately 40 degrees either side of the present heading. The MAP mode adds a pictorial presentation of the navigational situation to the compass sector. Navigation information includes VOR/DME station location and course line.

BEARING SELECTION (BRG)

The NV1, ADF, and NV2 buttons control which bearing pointer is displayed on the EHSI. Selection occurs by depressing the desired button. The bearing pointer may be deselected by depressing the button a second time or by selecting another bearing pointer. A bearing pointer will not appear when the nav source is a localizer frequency.

INTENSITY CONTROL (INT)

The intensity of the EHSI display is controlled by rotation of the INT knob. The display is brightened by clockwise rotation of the knob.

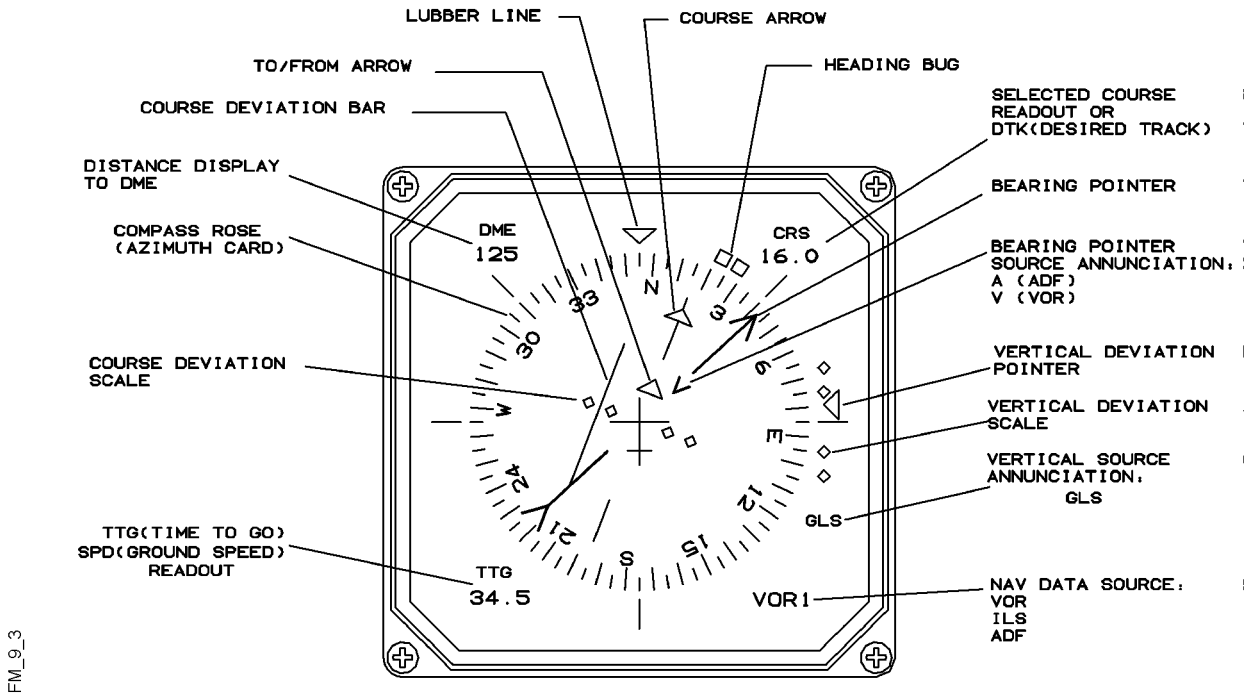

Figure 9-3. EHSI-74 DISPLAY HSI MODE

The three basic display modes of the EHSI-74 are the HSI mode, the ARC mode, and the MAP mode. When operating in the HSI mode, the screen presentation includes a full 360 degree compass rose with a triangular lubber line at the top of the screen, a magenta heading bug, a course deviation pointer with TO, FROM indicator, a digital course readout in the upper right hand corner, a digital DME readout in the upper left hand corner, and a Nav source indication in the lower right hand corner of the display.

A bearing pointer may be added to the display if one of the three BRG switches on the HCP-74 is selected. The NV1 bearing source is indicated by a single green arrow pointing directly to the selected VOR station. Selection of the NV2 displays a dual yellow pointer indicating the bearing to VOR2. With a Nav 1 or 2 bearing source selected, a V will appear near the center of the bearing pointer to indicate that a VOR is in use as the Nav source.

Selection of the ADF button on the HCP-74 will display a magenta bearing pointer on the display indicating the bearing to the No. 1 ADF. A magenta A will be displayed near the center of the bearing pointer indicating that the ADF is the NAV source.

If the Nav source receiver is tuned to a localizer frequency, a vertical deviation pointer will automatically be displayed on the right hand side of the EHSI-74 display for indication of the glide slope deviation.

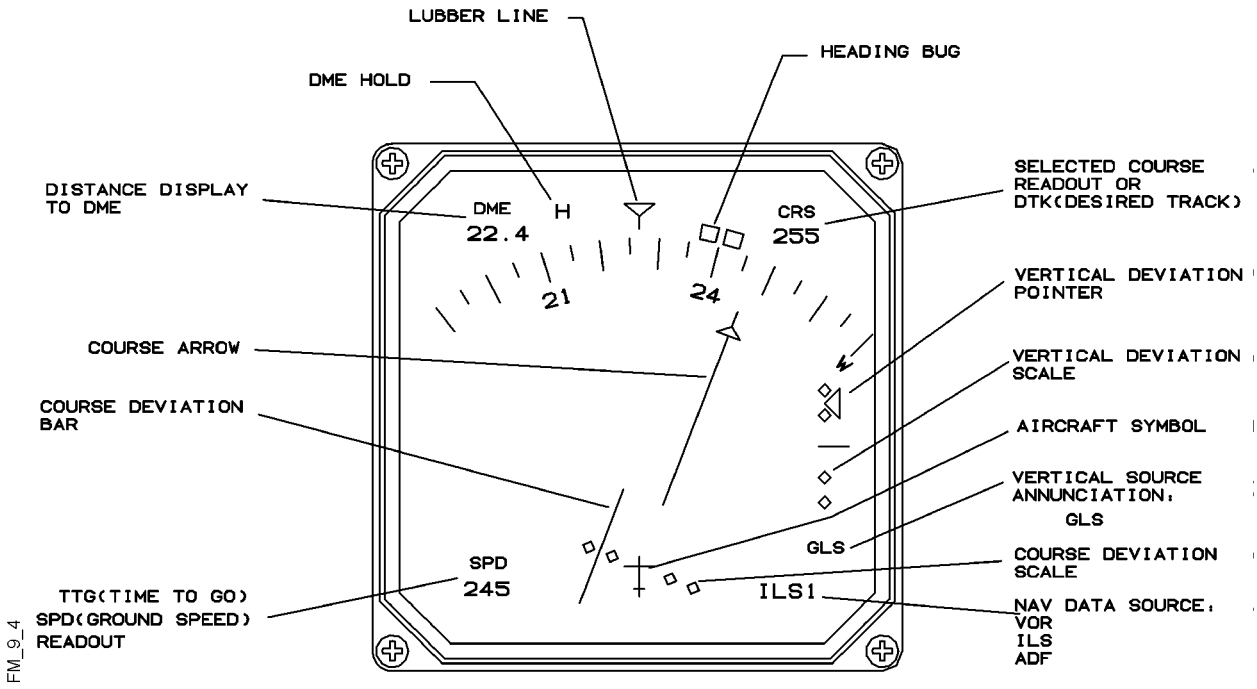

Figure 9-4. EHSI-74 DISPLAY ARC MODE

Selection of the ARC mode on the HCP-74 will result in the display of an expanded scale heading presentation (approximately 80 degree arc).

Bearing pointer operation remains unchanged in the ARC mode. However, only half of the bearing pointer and course deviation pointer is displayed. If the heading bug is positioned at a heading which is not shown on the 80 degree arc, a short magenta selected heading line appears and is rotated around the airplane symbol to indicate the relative position of the selected heading. The heading bug position is also indicated digitally in magenta in the upper right corner of the display, immediately below the digital course indication.

NOTE

Instrument approaches in the ARC mode are not approved.

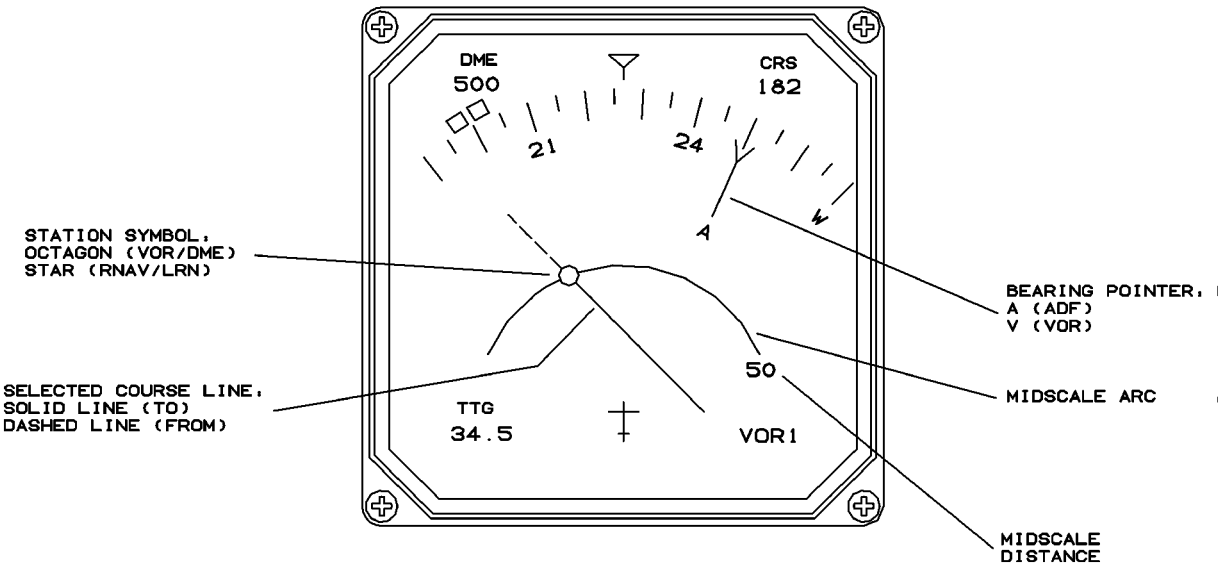

Figure 9-5. EHSI-74 DISPLAY MAP MODE

The MAP mode presentation is similar to the ARC presentation. The 80 degree arc is retained on the display. However, an additional range arc is provided across the center of the screen and the active Nav information is presented pictorially in relation to the range marking rather than as a course deviation pointer. The NAV 2 and ADF bearing pointer operation is the same as the ARC mode. For the NAV 1 bearing pointer, when VOR/DME data are selected, bearing and distance to the VOR/DME are shown pictorially in the proper rho-theta position with respect to airplane symbol. The VOR/DME station is represented by a green octagon symbol. The range marking across the center of the display indicates the mid-range distance. The user must double the indicated mid-range distance to determine the full range presented on the EHSI-74.

NOTE

Instrument approaches in the MAP mode are not approved.

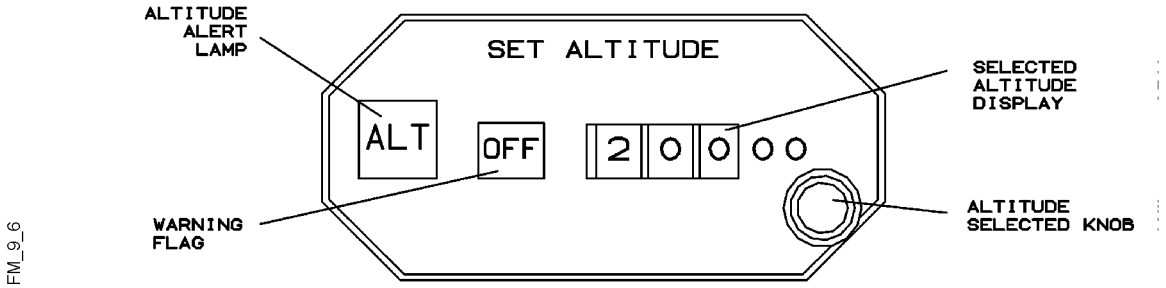

Figure 9-6. ALTITUDE ALERTER

ALTITUDE ALERTER

The altitude alerter provides aural and visual alert when the airplane first approaches a selected altitude and in the event the airplane altitude deviates ± 200 feet from a preset level.

ALT ANNUNCIATOR

ALT annunciator illuminates and a 3000 Hz audio tone sounds momentarily, whenever the airplane approaches 1000 ft before the selected altitude. The ALT annunciator extinguishes at 200 ft before the selected altitude.
The ALT annunciator will illuminate and audio tone will sound momentarily whenever a deviation from a preselected altitude of 200 ft occurs.

SET ALTITUDE

A three digit counter displays ten thousands, thousands and hundreds of feet and two fixed zeros represent tens and units; the altitude is preselected using the knob adjacent to the display.

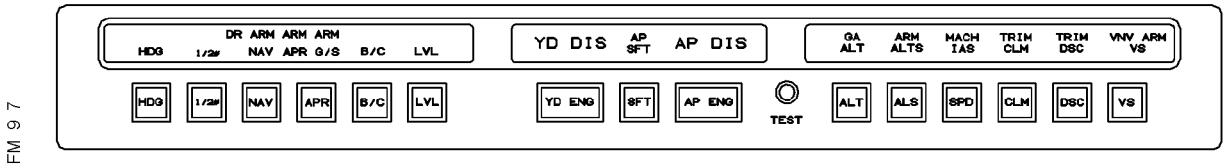

Figure 9-7. AC-180A AUTOPILOT CONTROLLER

AUTOPILOT ENGAGE SELECT BUTTON

This selector engages or disengages the autopilot. Engagement will only occur following satisfactory completion of a pre-engage diagnostic test which occurs each time AP ENG is selected. The yaw damper engages automatically when the autopilot is engaged. AP and YD will be annunciated in GREEN. Reselecting AP ENG will disconnect the autopilot while the yaw damper remains engaged. An aural annunciator will sound and an AMBER DIS annunciator will flash beside the AP annunciator for 5 to 7 seconds any time the autopilot is disengaged.

YAW DAMPER ENGAGE SELECT BUTTON

This selector engages or disengages the yaw damper when the autopilot is not engaged. YD will be annunciated in GREEN when the yaw damper is engaged. An AMBER DIS annunciation will flash for 5 to 7 seconds beside YD when the yaw damper is disengaged.

PITCH AND ROLL TRIM SWITCH

When the trim switch is displaced longitudinally or laterally without vertically pushing it, it will behave, if the flight director or autopilot are engaged, as a vertical or lateral slew switch.

When flying in basic attitude mode (no lateral or vertical modes selected), the slew switch can be used for inputting roll or pitch commands to the autopilot.

Commandable bank limits are ± 30° and commandable pitch limits are +20°, -18°. Operation of the roll slew switch will cancel any other lateral mode (when selected) except the APPROACH (APR) mode.

When no vertical mode is selected, one momentary action (click) of a duration of less than 0.5 second of the vertical slew switch provides a 0.25° pitch change in the direction of activation.

Vertical slew switch activation lasting longer than 0.5 second will cancel the vertical mode selected and result in a continuous rate increase or decrease in pitch.

When IAS, CLM, MACH, ALT, DSC or VS are selected, each click of the vertical slew switch will provide respectively ± 1 kts, ± 1 kts, ± 0.01 Mach, ± 25 ft, ± 200 fpm or ± 200 fpm change.

1/2 Φ ("HALF BANK ANGLE")

The "1/2 Φ" mode limits all roll maneuvers to approximately one half of that experienced in normal operation. Capture of NAV and APR mode clears the "1/2 Φ" mode when selected.

SOFT RIDE (SR)

Selection of soft ride reduces overall autopilot authority to prevent excessive control inputs in turbulent air. Soft ride is automatically cancelled after APR capture.

ROLL HOLD MODE

The autopilot operates in the Roll Hold Mode when engaged with no modes selected on the Autopilot Controller. The roll angle present at time of AP engagement will be maintained by the autopilot. Roll control is commanded by the slew switch on the control wheel.

LEVEL MODE

Selection of Level Mode (LVL) commands the autopilot and flight director to fly a wing level attitude.

HEADING MODE

Selection of the Heading Mode (HDG) brings the flight director command bars into view and commands are provided to fly to and hold the heading selected by the heading marker on the EHSI.
The maximum commanded bank angle limit for heading changes is ± 25°.

NAVIGATION MODE

The Navigation Mode (NAV) provides steering commands to the Flight Director Bars for tracking navigation signals from the selected NAV source (VOR, LOCALIZER, R-NAV, VLF). For radio course intercepts, NAV is selected and NAV ARM and HDG are annunciated. Heading signals are followed until the airplane is in a position from which a NAV intercepts can be accomplished. Steering commands are provided to capture and track the radio signal. The radio course may be intercepted at any angle up to 90°. When operating from a VOR signal, command smoothing to facilitate station passage is provided by a Dead Reckoning submode. DR is annunciated when the airplane is in the cone of confusion over a VOR and the flight director provides steering commands to maintain the present heading until a reliable NAV signal is available to provide steering commands.

Roll angles are limited to ± 10° after capture in the NAV mode.

NOTE

VOR approaches must be conducted in APR mode.

NOTE

Intercept angle must be established before selecting the NAV mode.

APPROACH MODE

The Approach Mode (APR) provides steering commands for VOR, RNAV, ILS, or Back-Course (B/C) approaches.

For VOR approaches, APR should be selected and a VOR frequency must be tuned into the appropriate NAV receiver. APR ARM is annunciated and steering commands are provided to intercept the VOR beam. Upon intercepting the beam, the APR ARM annunciator will switch to APR and the signal will be tracked for the approach. As in the NAV mode, the flight director will revert to Dead Reckoning (DR) when crossing a VOR and the Course Select knob should be used for course changes up to 30 degrees when over the station.

For ILS approaches, the NAV receiver must be tuned to a localizer frequency and APR must be selected. APR ARM will be annunciated and steering commands will be provided to intercept the localizer. Upon capture of the localizer, APR ARM will revert to APR and G/S ARM will be annunciated. Steering commands will be provided to maintain the localizer centerline. G/S ARM will revert to G/S upon capture of the glide slope beam. Glide slope capture cancels all other vertical modes.

The vertical and lateral slew switches are inoperative during G/S and localizer tracking.
During VOR and B/C approaches, only the lateral slew switch is inoperative.

BACK-COURSE MODE

The Back-Course Approach Mode (B/C) is selected for localizer back-course approaches. APR and B/C must be selected and B/C and APR ARM will be annunciated until localizer capture when APR ARM reverts to APR. Steering commands are presented as if the approach were to a localizer front-course and the glide slope is biased out of view for the approach. The front course bearing must be selected on the EHSI.

CLIMB MODE

The Climb Mode (CLM) provides a preprogrammed profile based upon indicated airspeed which is optimized for passenger comfort during climbs. The climb profile maintains 160 KIAS up to 30,000 ft and then reduces 1 kts for every 1000 ft, and can be altered as desired by single activations of the vertical trim switch (1.0 KIAS per activation). The Climb Mode automatically arms the ALTS Mode.

PITCH HOLD MODE

Whenever the autopilot is engaged without selecting a vertical mode, the pitch attitude at the time of engagement is held by Pitch Hold Mode. Pitch hold will also maintain the pitch attitude present at the time of disengagement of a vertical mode.

Pitch attitude may be varied by use of the AP SYNC switch or by the Vertical Slew Switch. The AP SYNC switch synchronizes the command bars and the autopilot to the aircraft pitch attitude at the time the switch is released. The airplane may be hand flown without disengaging the autopilot while the AP SYNC switch is depressed. The vertical trim switch will provide a 0.25° pitch change for each activation or a fixed slew rate to the command limits of the autopilot if held longer than 1/2 second. Vertical trim switch operation is locked out during glide slope tracking.

ALTITUDE HOLD MODE

The Altitude Hold Mode (ALT) results in flight director and autopilot commands to maintain the altitude present at the time the mode is selected. Aircraft rate of climb should not exceeed 500 feet per minute to achieve a smooth transition to level flight at the desired altitude. ALT may be cancelled by selecting another vertical mode or depressing the AP SYNC switch.

ALTITUDE PRESELECT MODE

The Altitude Preselect Mode (ALTS) works in conjunction with the Altitude Preselector/Alerter to provide the pilot with the ability to select an altitude for level off and hold prior to reaching that altitude. ALTS may be used simultaneously with other vertical modes (SPD, VS, CLM, DSC) to "profile" a climb or descent with a level off and automatic engagement of ALTS at a preselected point.
Selection of any vertical mode or any change on the altitude preselector will automatically arm the ALTS mode.

VERTICAL SPEED HOLD MODE

The Vertical Speed Hold Mode (VS) will hold any vertical speed present at the time the mode is selected which will result in increasing airspeed in descents and decreasing airspeed in climbs. This mode can be cancelled by selecting another vertical mode. Vertical speed may be varied by momentary activations of the vertical slew switch.

SPEED HOLD MODE

The Speed Hold Mode (SPD) maintains both airspeed or Mach number as function of the altitude and true airspeed of the aircraft at the moment of its selection. If the SPD button is pushed when the aircraft is above approximately 27,250 ft of indicated altitude and above 298 KTAS (True Airspeed), the Mach Hold Mode will engage, and the Mach green light will appear on the autopilot control panel. If the button is pushed when the a/c is approximately below 27,250 ft or below 298 KTAS, the IAS mode will engage. A second push on the SPD button will change IAS mode to MACH or MACH to IAS and the corre-

sponding green light will appear on the autopilot control panel. Pushing the button a third time will cancel the SPD mode.

DESCENT MODE

The Descent Mode (DSC) provides a preprogrammed profile based upon vertical speed which is optimized for passenger comfort during descents. The descent profile can be altered as desired by single activations of the vertical trim switch (200 ft/min. per activation). The DSC Mode automatically arms the ALTS Mode.

CAUTION

Unmonitored operation in VS, CLM or DSC can result in speeds exceeding V_{MO}/M_{MO} during descents or speeds below the minimum autopilot operating speed during climbs.

TEST BUTTON

The Test Button activates a system diagnostic mode consisting of a lamp test and other test routines which may be performed on the ground or in flight. Inflight activation of the test button will not interfere with the system operation but will provide a momentary lamp test. Depressing and holding the test switch following an autopilot failure will display a coded series of annunciations which may be useful to maintenance personnel for problem diagnosis.
If a failure appears during AP operation, the test button may be used to provide failure coded information for maintenance personnel.
If in flight, the pilot should push the test button and record any code appearing after the lamp test.
Then the pilot should push and hold the test button in conjunction with HDG, ALT, SPD and VS button, one at a time, and record any appearing code.

MSW BUTTON

The MSW Button is located on the outboard side of the pilot's and copilot's control wheel. Activation of the switch will disconnect the autopilot and/or the yaw damper if engaged.

AP SYNC SWITCH

The AP SYNC switch is located on the inboard side of the pilot's and copilot's control wheel. In Flight Director Mode, activation of the AP SYNC button will synchronize FD command bars to the present attitude of the airplane. Upon releasing the AP SYNC switch, commands will be displayed to maintain the selected attitude and the previously selected lateral mode. Activation of the AP SYNC switch during autopilot operation, while performing the above items, also disengages the primary autopilot servos to allow the airplane to be flown manually as long as AP SYNC is depressed. After glide slope capture in the approach mode, AP SYNC will disengage the autopilot servos for manual steering inputs but no change will occur in the flight director presentation and once released, commands are generated to return the airplane to the center of the glide slope.

AUTOPILOT TRIM

When engaged, the autopilot will command changes in longitudinal trim to relieve elevator control forces. The white TRIM annunciator will illuminate to indicate an out-of-trim condition. A red TRIM annunciation is also presented when a trim system failure is detected. The autopilot will not engage with a trim failure existing.

GO-AROUND MODE

The Go-Around Mode can be selected only from Approach Mode and is activated by depressing the GA switch on the left power lever (right on the airplanes S.N. 1004 to 1021 without S.B. 80-0040). If the autopilot is engaged and in APR mode, it will fly a fixed 8° pitch up and wings level attitude for the Go-Around maneuver. In flight director mode, the GA will command the command bars to present a 8° pitch up and wings level attitude. Operation of the AP SYNC button while in Go-Around Mode will cancel Go-Around Mode and synchronizes the command bars to the pitch attitude of the airplane.

WARNING FLAGS

a) HEADING FLAG
The HDG flag indicates a failure of the primary compass system. All heading display and command information is unusable. If the autopilot is engaged, cancel heading mode. The airplane may continue to be flown by the autopilot in the attitude hold mode. VOR, localizer and glide slope deviation displays are still correct. The heading flag is located on the upper portion of EHSI.

b) GLIDE SLOPE FLAG
The glide slope flag indicates a malfunction of the glide slope section of the VHF NAV-1 receiver or a unreliable glide slope signal when the unit is tuned on a localizer frequency. Vertical commands for an ILS approach will be unusable. All other vertical commands will remain operational. The flag will be found on both the ADI (GS) and EHSI (GLS) over the glide slope scale.

c) ATTITUDE FLAG
The GYRO flag indicates a failure of the primary vertical gyro. All attitude information will be unusable. Navigation and heading information remains operational. The autopilot will not engage with an attitude flag in view. The attitude flag is located in the bottom left portion of the ADI.

d) COMPUTER FLAG
The COMPUTER flag indicates a failure of the autopilot computer. All command information from the flight director is unusable (V-bars are out of view) and the autopilot become inoperative. Attitude, navigation, and heading information is still usable. The computer flag is located in the bottom right portion of the ADI.

e) NAVIGATION FLAG
The NAV flag indicates a malfunction of the lateral deviation bar information source. Roll steering commands for navigation or approach are unreliable when the NAV flag is in view. Lateral control of the autopilot should be deferred to heading or attitude hold. The flag is located on the central portion of the EHSI.

f) HPU-74 AND HCP-74 FLAGS
The FAIL indication displayed vertically, above the lower right corner of the display, appears when the processor monitor detects a failure in the processor of the EHSI (HPU-74).
The HCP indication displayed in the same area as the FAIL indication appears to signal a failure (such as a stuck button). in the EHSI Control Panel

g) ALT OFF FLAG
The altitude alert OFF flag is in view whenever main power fails or synchro excitation is invalid.

AUTOPILOT MODE ANNUNCIATIONS

a) Trim (Red) - Illuminates when a trim failure has occurred. Do not engage the autopilot with the trim failed.

b) AP (Red) - Illuminates when a failure has been detected by the autopilot. The autopilot will automatically disengage. Do not attempt to re-engage the autopilot.
c) DIS (Amber) - Illuminates when the function preceeding the DIS has been disengaged.
d) Lateral or Vertical Mode Annunciation (Green) - The green annunciator for a lateral or vertical mode will flash when the signal to that mode is lost or unreliable. Select another mode which uses a different information source if possible (Example: A flashing NAV annunciator may indicate the loss of a navigation signal or a flashing ALT annunciator may indicate a loss of the air data information).
The green annunciator when steady means that a lateral or vertical mode may be active or in arm condition (if applicable) being this last status displayed by the corresponding ARM white annunciator.

AURAL WARNING

a) Autopilot Disconnect - A 500 Hz frequency that fades to inaudible in one second approximately; it is activated when the autopilot disengages unless an higher priority aural warning occured.
b) Altitude Alert - A 3000 Hz frequency with an approximate duration of 1 second that activates either 1000 ft before the preselected altitude is reached (acquisition mode) or when the flying altitude differs by ± 200 ft from the preselected value (deviation mode).

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 2 FOR THE COLLINS ADS-85 AIR DATA SYSTEM

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Collins ADS-85 (Air Data System) is installed. The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

ABBREVIATIONS

ADC	Air Data Computer
ALI	Barometric Altimeter
IAS	Indicated Airspeed
IVSI	Inertial Vertical Speed Indicator
M_{MO}	Maximum Operating Mach Number
MSI	Mach Speed Indicator
PRE	Preselector/Alerter
V_{MO}	Maximum Operating Airspeed
VSI	Vertical Speed Indicator

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SECTION 2 – LIMITATIONS

The following limitations apply to the P.180 airplane when equipped with the ADS-85 system:

a) The ADC test must be performed prior to the flight.
b) The ALI, MSI, VSI individual test must be performed prior to the flight.

SECTION 3 – EMERGENCY PROCEDURES

EMERGENCY PROCEDURES CHECKLIST

LOSS OF AIR DATA (PRIMARY AIR DATA INFORMATION)

a) Maintain the air data parameters using copilot air data information.
b) ADC/ALI - MSI/ADC circuit breakers - RESET
c) L PITOT ST HTR circuit breaker - CHECK

NOTE

Loss of primary air data information disables the overspeed warning tone generation.

LOSS OF VERTICAL SPEED INDICATOR (VSI) DATA

a) Maintain vertical speed data parameter using copilot IVSI information.
b) PRE/VSI circuit breakers - RESET

NOTE

In case of PRE/VSI circuit breaker trip the preselector/alerter becomes inoperative.

LOSS OF MACH SPEED INDICATOR (MSI) DATA

a) Maintain airspeed data using copilot airspeed indicator
b) MSI/ADC circuit breaker - RESET

LOSS OF BAROMETRIC ALTIMETER (ALI) DATA

a) Maintain barometric altitude using copilot barometric altimeter
b) ADC/ALI circuit breaker - RESET
c) Transponder - SWITCH from ALT to ON position

AMPLIFIED EMERGENCY PROCEDURES

LOSS OF AIR DATA (PRIMARY AIR DATA INFORMATION)

The total loss of air data parameters (VS - IAS - ALT) on primary air data instruments (pilot side) is indicative of a failure of the air data system.
The pilot may attempt to reset the system by resetting the circuit breakers labeled ADC/ALI, MSI/ADC and L PITOT ST HTR. Maintain airplane control using the copilot air data instruments. Corrective maintenance action should be performed prior to the next flight.

NOTE

Loss of primary air data information disables the overspeed warning tone generation.

LOSS OF VERTICAL SPEED INDICATOR (VSI) DATA

The loss of vertical speed data is annunciated by the appearance of the instrument warning flag.
The pilot may attempt to reset the VSI by resetting the circuit breaker labeled PRE/VSI and by performing the instrument test. Maintain airplane control using the vertical speed data of the copilot IVSI.
Corrective maintenance action should be performed prior to the next flight.

NOTE

In case of PRE/VSI circuit breaker trip the preselector/alerter becomes inoperative.

LOSS OF MACH SPEED INDICATOR (MSI) DATA

The loss of mach speed data is annunciated by the appearance of the instrument warning flag.
The pilot may attempt to reset the MSI by resetting the circuit breaker labeled MSI/ADC and by performing the instrument test. Maintain airplane control using the copilot airspeed indicator.
Corrective maintenance action should be performed prior to the next flight.

LOSS OF BAROMETRIC ALTIMETER (ALI) DATA

The loss of baro corrected altitude data is annunciated by the appearance of the instrument warning flag.
The pilot may attempt to reset the ALI by resetting the circuit breaker labeled ADC/ALI and by performing the instrument test. Maintain airplane control using the copilot baro altimeter.
Corrective maintenance action should be performed prior to the next flight.
If transponder is in altitude mode (ALT) return to normal mode (ON).

SECTION 4 – NORMAL PROCEDURES

NORMAL PROCEDURES CHECKLIST

PREFLIGHT CHECK

a) Battery switch - BAT
b) AVIONICS switch - ON
c) OVSP WRN - TEST
d) Air Data Computer - TEST
e) VSI TEST button - PUSH
f) MSI TEST button - PUSH
g) ALI TEST button - PUSH
h) ALI BARO knob - TEST and SET
i) PRE ALT ALERT light/switch - PUSH

AMPLIFIED EMERGENCY PROCEDURES

PREFLIGHT CHECK

During the preflight check the pilot should perform all of the checks listed herein, in addition to the "Cockpit Preflight" checks listed in Section 4 of the Pilot's Operating Handbook.
The pilot should verify that battery switch is set to BAT position and AVIONICS switch is set to ON position.

Select on the SYS TEST panel the OVSP WRN position and press the test button, the aural overspeed warning is activated.

Select on SYS TEST panel the ADC position and press the test button and hold. On annunciator panel ADC FAIL annunciator illuminates then goes OFF within 1/2 second. ALI flag comes into view and the pointer goes to the 250-foot mark, VSI flag comes into view and the pointer goes to 6000 feet/minute down, MSI flag comes into view, the V_{MO} and IAS pointers go to 0 knots and Mach digits go blank.
Release the test button: ADC FAIL annunciator remains off, all instruments flags retract and normal conditions are restored.

On Vertical Speed Indicator push and hold the TEST button; verify instrument warning flag appears in approximately 1/2 sec., the pointer slews to 6000 ft/min up taking the shortest path.
Release TEST button, verify normal conditions are restored.

On Mach Speed Indicator push and hold the TEST button; verify warning flag comes into view and Mach display goes blank, the IAS and V_{MO} pointers slew to 300 knots and after approximately 1 sec. the two pointers slew to 0 knots.
Release TEST button, verify normal conditions are restored.

On barometric altimeter push and hold TEST button; verify warning flag comes into view in approximately 1/2 sec. Altitude pointer slews to 750 feet.
Release TEST button, verify normal conditions are restored. Turn the ALI BARO knob and observe that the baroset digits and altitude pointer respond accordingly. Adjust the BARO knob for a reading of 29.92 on the baroset digits. Pull on the BARO knob for MB and check that 1013 is displayed.
Set the barometric display to the correct local pressure value.

On preselector alerter push the ALT ALERT light/switch; verify ALT ALERT illuminates and warning flag comes into view.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 6 – WEIGHT AND BALANCE

Installation of the Collins ADS-85 Air Data System is included in the weight and balance information presented in Section 6 of the Pilot's Operating Handbook.

SECTION 7 – SYSTEM DESCRIPTION AND OPERATION

The ADS-85 Air Data System consists of an air data computer mounted on the nose electronic bay and of a barometric altimeter indicator, a Mach speed indicator, a vertical speed indicator and a preselector/alerter. All instruments are installed on the instrument panel pilot section.

ADC-85 AIR DATA COMPUTER

The air data computer receives pitot and static pressure from the pitot and static system and outside air temperature from a temperature sensor located on the bottom of the nose surface, processes them and output signals to baro altimeter indicator, vertical speed indicator, Mach speed indicator, preselector/alerter and autopilot.
An air data module, plugged into the top of the computer, is programmed according to the particular aircraft characteristics.

BAROMETRIC ALTIMETER

The barometric altimeter consists of:

a) Altitude pointer - the pointer displays 1000 feet for each complete revolution, with 20-foot scale marks. The altitude displayed is corrected for position error.
b) Altitude display - the 5-digit display indicates -1000 to +50000 feet, the altitude display changes every 100 feet.
c) Barometric display - the 4-digit display indicates either inches of mercury (in Hg) or millibars (MB). Correction range is 22.00 to 32.00 in Hg. Barosetting is stored indefinitely during power-off conditions and restored to the last setting upon return to power. Barocorrection is added to the computations and corrected altitude (in feet) will then be displayed.
d) BARO correction knob - used to adjust the barometric display setting either in Hg or MB as selected by push-pull action of the knob.
e) Push-to-test operation - this button exercises the internal self-test circuits.

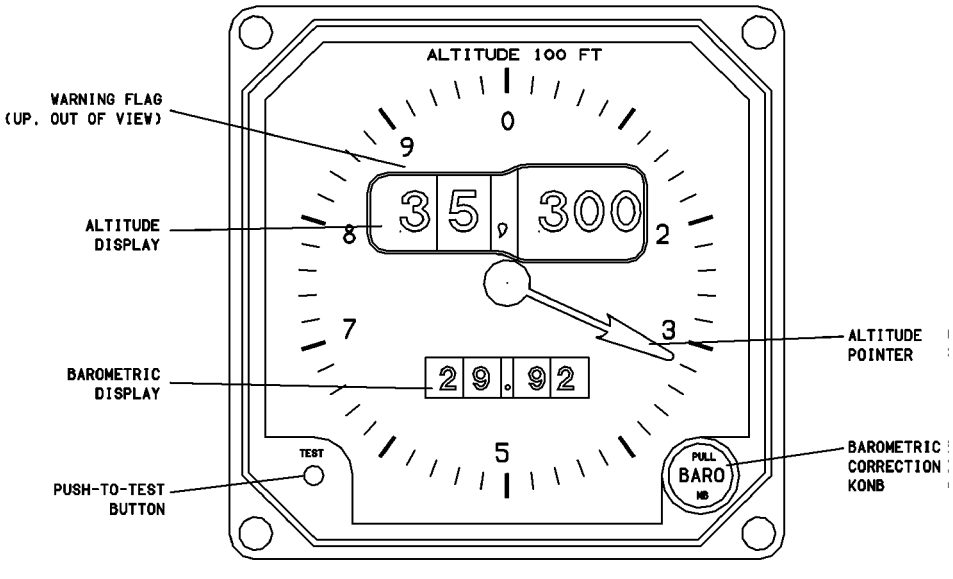

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Figure 9-8. BAROMETRIC ALTIMETER

MACH SPEED INDICATOR

The Mach Speed Indicator consists of:

a) IAS display - single pointer display of indicated airspeed. The scale is nonlinear to optimize readability over the entire range. The IAS pointer displays indicated airspeed between 60 and 420 knots. Scale marks are provided every 2 knots up to 200 knots with marks every 10 knots above 200.

b) V_{MO} display - single pointer display of maximum operating airspeed. V_{MO} is displayed in terms of knots IAS. Values of V_{MO} that define the aircraft V_{MO}/M_{MO} profile are programmed into the air data computer. In the M_{MO} region of the profile, the maximum operating Mach value is translated by the air data computer to the maximum operating airspeed (V_{MO}) at the particular altitude and is displayed in knots by the V_{MO} pointer. As the aircraft ascends or descends, V_{MO} values supplied by the air data computer allow the V_{MO} pointer to create a visual display of the aircraft V_{MO}/M_{MO} profile.

c) Mach display - 2-digit numerical drum displays indicated Mach number over the range of 0.30 to 0.99 Mach. If the Mach number is below 0.30 or above 0.99, the display will blank. The Mach display also blanks when a loss of data is detected.

d) Airspeed reminder marker (bug) - this bug provides a visual reminder of a desired airspeed. The servo-driven bug is remotely commanded by the autopilot system and can be manually controlled, at any time, by turning the bug knob.

e) Push-to-test operation - this button exercises the internal self-test circuits.

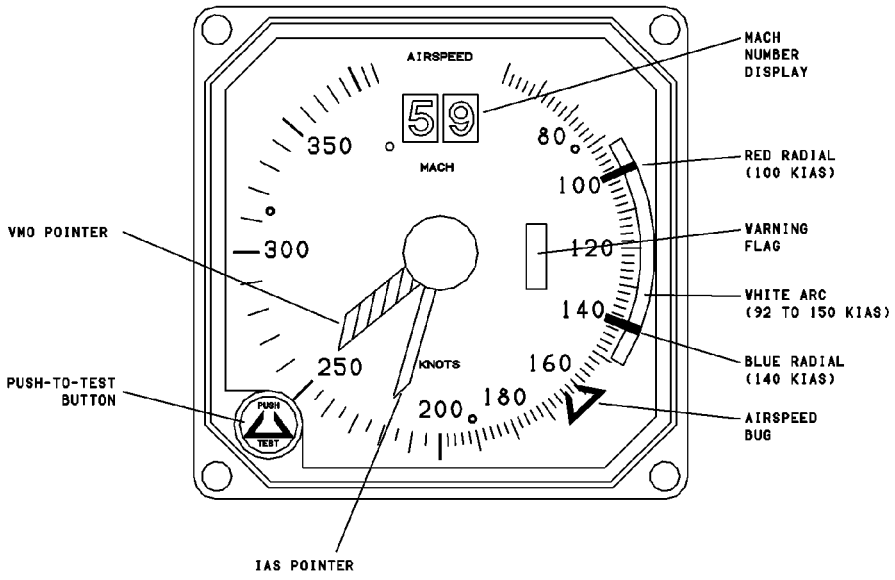

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Figure 9-9. MACH SPEED INDICATOR

VERTICAL SPEED INDICATOR

The vertical speed indicator consists of:

a) Vertical speed display - the pointer displays vertical speeds over the range of 6000 ft/min up or down. The scale markings are made nonlinear to optimize readability, with 100 ft/min marks up to +1000 ft/min and 500 ft/min marks thereafter.
b) Push-to-test operation - this button exercises the internal self-test circuits.
c) Vertical speed reminder marker (bug) - this bug is a servo-driven display that provides a visual reminder of desired vertical speed. The servo-driven bug is commanded via remote input from the autopilot system and can be manually controlled, at any time, by turning the bug knob.

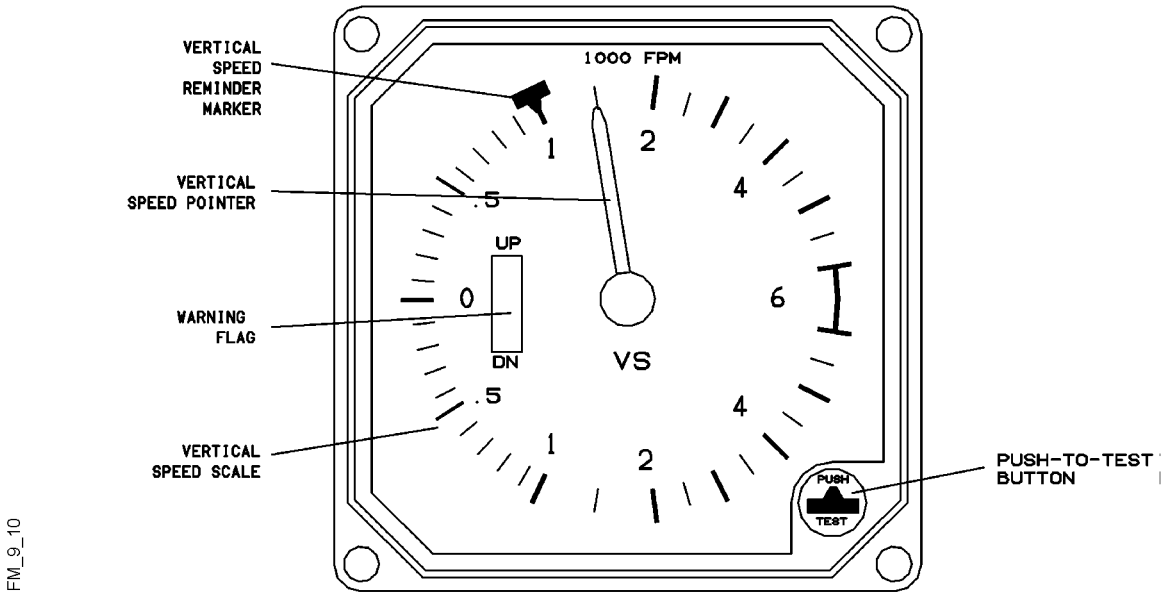

Figure 9-10. VERTICAL SPEED INDICATOR

PRESELECTOR/ALERTER

The preselector/alerter is used to preselect an altitude to be captured by the flight control system and to provide the pilot with alerting signals when approaching to or deviating from the selected altitude.
Actual altitude is compared with the preselected altitude: visual and aural alerts are generated in two situations, depending on whether the system is in the acquisition (capture) mode or deviation (after capture) mode.

The preselector/alerter consists of:

a) Selected altitude display - the 5-digit numerical readout displays the altitude for which the unit has been set to provide its alerting preselect operation.
b) ALT ALERT lamp illuminates 1000 feet before the preselected altitude (acquisition mode) is reached and flashes if the airplane deviates ± 200 feet from the preselected altitude. When lamp is on or flashing a trigger signal is sent to the aural warning box. The ALT ALERT lamp on the unit also contains an integral switch operated by pushing the lens cap. The switch is used as a push-to-cancel feature for the alert function.
c) Push-to-test operation - the ALT ALERT light/switch may be pushed at any time to initiate a lamp test mode. The aural warn output is not actuated, and the flight control output data is not affected. If an alert has been triggered as in paragraph b) above, the first push of the ALT ALERT lens cap would cancel the alert a second push would initiate lamp test mode.
d) Altitude select knob - the altitude select knob beneath the altitude select display is used to set the altitude on selected altitude display.

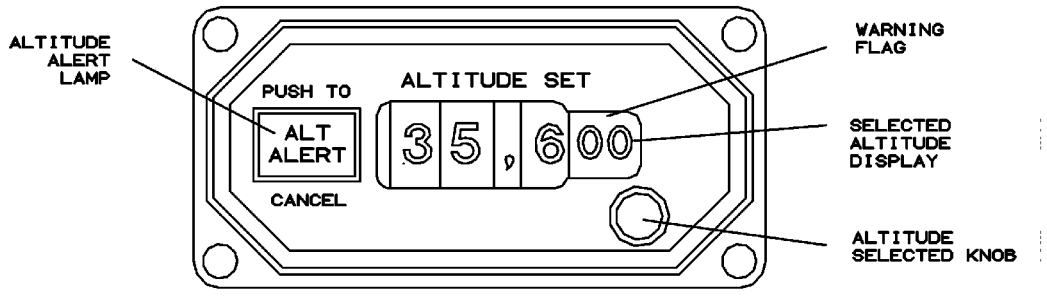

Figure 9-11. PRESELECTOR/ALERTER

WARNING FLAGS AND WARNING ANNUNCIATORS

a) ADC FAIL - amber annunciator comes on to indicate a failure of air data computer.
b) ALI warning flag - a red warning flag comes into view in the altitude display window when a failure is detected by the monitor circuits or when incoming data is lost. The pointer slew to the 250-foot mark (taking the shortest path).
c) MSI warning flag - a red warning flag appears when monitor circuits detect a failure in either IAS or V_{MO} circuits, or when incoming data is lost. The warning circuits also cause the pointer of the faulted channel to go to zero.
d) VSI warning flag - a warning flag appears in a window and the pointer goes to 6000 ft/min down when monitor circuits detect a failure or when incoming data is lost.
e) PRE warning flag - when internal monitor circuits detect a failure or when incoming data or power is lost, a red warning flag appears in front of the units and 100's zeros to warn that the alert system is not operating.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 3 FOR THE COLLINS EFIS-85B ELECTRONIC FLIGHT INSTRUMENT SYSTEM

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Collins EFIS-85B (Electronic Flight Instrument System) is installed. The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

ABBREVIATIONS

APPR	Approach
AVCS	Avionics
BRG	Bearing
COMP	Composite (Display Format)
CRS	Course
CRT	Cathode Ray Tube
DH	Decision Height
DPU	Display Processor Unit
DSP	Display Select Panel
EADI	Electronic Attitude Director Indicator
EFD	Electronic Flight Display
EHSI	Electronic Horizontal Situation Indicator
EMG	Emergency
ENR	Enroute
ET	Elapsed Time
FMS	Flight Management System
GSP	Ground Speed
IAS	Indicated Airspeed
L NAV	Long Range Navigation
MFD	Multifunction Display
MPU	Multifunction Processor Unit
OAT	Outside Air Temperature
PGE	Page
RA	Radio Altimeter
TST	Test
TTG	Time To Go
WX	Weather Mode
XFER	Transfer

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SECTION 2 – LIMITATIONS

The following limitations apply to the P.180 airplane when equipped with the Collins EFIS-85B4 (Electronic Flight Instrument System) 3 tube version:

a) The DRIVE XFER-NORM switch must be checked for proper operation in both the DRIVE XFER and NORM modes prior to flight.

b) The EADI COMP-NORM-EHSI COMP switch must be checked for proper operation in all the three positions prior to flight.

c) Multifunction display PGE (page) and EMG (emergency) check lists are for reference purposes only. The Approved Pilot's Operating Handbook incorporates the approved procedures for all operations.

d) Back course approaches are prohibited in the APPR, ENR, EADI COMP and EHSI COMP formats.

e) Operation in either EADI COMP or EHSI COMP formats in IFR conditions is limited to emergency use only. Take-off not permitted using composite formats.

f) Use of APPR and ENR formats for approaches is limited to the inbound front course only.

g) Airspeed indication displayed on the EADI is not to be used as primary airspeed information.

h) Primary Vertical Gyro, Secondary Vertical Gyro Stand-by Gyro Horizon must be serviceable as well as the main avionics fan ("AVCS FAN FAIL". annunciator OFF).

SECTION 3 – EMERGENCY PROCEDURES

EMERGENCY PROCEDURES CHECKLIST

NOTE

Detailed information on each warning flag which might appear on the EFIS displays is contained in Section 7 "System Description and Operation" of this Supplement.

a) LOSS OF PRIMARY ATTITUDE DATA
XSIDE ATT-NORM switch - ATT

If attitude data is not restored:
Refer to back-up data

b) LOSS OF PRIMARY COMPASS DATA
XSIDE HDG-NORM switch - HDG

If heading data is not restored:
Refer to back-up data

c) LOSS OF EHSI DISPLAY
EADI COMP-NORM-EHSI COMP switch - EADI COMP

d) LOSS OF EADI DISPLAY
EADI COMP-NORM-EHSI COMP switch - EHSI COMP

e) DPU FAIL ANNUNCIATOR ON OR LOSS OF BOTH EADI AND EHSI DISPLAY
DRIVE XFER-NORM switch - DRIVE XFER
DPU 1 circuit breaker - PULL

If displays are not restored:
HSI 1 circuit breaker - PULL
ADI 1 circuit breaker - PULL
EADI COMP-NORM-EHSI COMP switch - EHSI COMP

f) EFD FAN ANNUNCIATOR ON

CAUTION

Limit the EHSI operation as much as possible.

EADI COMP-NORM-EHSI COMP switch - EADI

g) COMP MFD FAN ANNUNCIATOR ON
MFD operation - MONITOR

In the event of malfunction:
MFD circuit breaker - PULL

h) DPU FAN ANNUNCIATOR ON
DRIVE XFER-NORM switch - DRIVE XFER
DPU 1 circuit breaker - PULL

i) MPU FAN ANNUNCIATOR ON
MFD operation - MONITOR

In the event of malfunction:
MFD circuit breaker - PULL
MPU-L circuit breaker - PULL

j) AVCS FAN FAIL ANNUNCIATOR ON
OAT - MONITOR
Avoid long time operation in hot atmosphere

Otherwise:
Non-essential avionics equipment circuit breakers - PULL

k) DSP WARNING FLAG ON

CAUTION

Last selections before DSP failure remain effective for both EADI and EHSI.
Autopilot lateral modes operation is limited to heading-hold only (vertical modes are not affected).

l) PIT/ROL/HDG COMPARATORS WARNING FLAGS AND EFIS MASTER RESET ANNUNCIATOR ON

CAUTION

Disagreement between attitude/heading sources has been detected.

EFIS MASTER RESET annunciator/pushbutton - PUSH
Refer to back-up indicators to identify the failed source
Select appropriate attitude/heading sensor on EFIS panel by actuating the XSIDE ATT-NORM or XSIDE HDG-NORM switch

AMPLIFIED EMERGENCY PROCEDURES

NOTE

Detailed information on each warning flag which might appear on the EFIS displays is contained in Section 7 "System Description and Operation" of this Supplement.

a) LOSS OF PRIMARY ATTITUDE DATA
The loss of primary attitude data is annunciated on EADI by the appearance of the ATT 1 flag. The pilot must switch the system to the secondary (cross-side) attitude reference to restore normal display operation by setting on EFIS panel the XSIDE ATT-NORM switch to ATT position.
If attitude data is not restored refer to back-up data.
Corrective maintenance action should be performed prior to next flight.

b) LOSS OF PRIMARY COMPASS DATA
The loss of primary compass data is annunciated on EFIS by the appearance of the HDG flag on the EHSI and MFD. The pilot must switch the system to the secondary (cross-side) heading reference to restore normal display operation, by setting on EFIS panel XSIDE HDG-NORM switch to HDG position.
If heading data is not restored refer to back-up data.
Corrective maintenance action should be performed prior to next flight.

c) LOSS OF EHSI DISPLAY
The loss of EHSI display only indicates the failure of the EFD itself or of its power supply. The pilot should position the EADI COMP-NORM-EHSI COMP switch to EADI COMP. Following this action a combined attitude and navigation picture is provide on the EADI.
Corrective maintenance action should be performed prior to next flight.

d) LOSS OF EADI DISPLAY
The loss of EADI display only indicates the failure of the EFD itself or of its power supply. The pilot should immediately select the composite mode by setting on EFIS panel the EADI COMP-NORM-EHSI COMP switch to EHSI COMP position. Following this a combined attitude and navigation picture is provided on the remaining EFD. In order to determine if the loss of EADI was due to a transient condition the pilot may attempt to reset the ADI 1 circuit breaker (if tripped). If after repositioning the above switch to NORM the EADI display is not restored then the same switch must be positioned to EHSI COMP and the ADI 1 circuit breaker, on the pilot circuit breaker panel, pulled out for the remainder of flight.
Corrective maintenance action should be performed prior to next flight.

e) DPU FAIL ANNUNCIATOR ON OR LOSS OF BOTH EADI AND EHSI DISPLAY
The presence of a DPU FAIL annunciation in the center of the EADI and EHSI displays indicates a failure of the DPU (Display Processor Unit). If the EADI and EHSI are totally lost, then a power failure to the DPU (or both displays) is likely the cause. In either case the pilot's first priority is to maintain the airplane control by referring to the back-up instruments. Then the pilot must set the DRIVE XFER-NORM switch on the EFIS panel to the DRIVE XFER position and pull the DPU 1 circuit breaker located on the pilot circuit breaker panel.
If displays are not restored, pull the circuit breakers labeled HSI 1 and ADI 1, located on the pilot circuit breaker panel, then set the EADI COMP-NORM-EHSI COMP switch to EHSI COMP position. This will provide a combined attitude and navigation display on the MFD.
Corrective maintenance action should be performed prior to next flight.

f) EFD FAN ANNUNCIATOR ON

CAUTION

Limit the EHSI operation as much as possible.

The illumination of the EFD FAN amber annunciator on the EFIS panel indicates the loss of the fan cooling both the EFDs (EHSI and EADI).
To reduce heating and cooling requirements the pilot should avoid simultaneous long time operation of both the EFDs by positioning the EADI COMP-NORM-EHSI COMP switch to EADI COMP. Following this action a combined attitude and navigation information will be displayed on the EADI whereas the EHSI will drop. Short time EHSI operation can be resumed by repositioning the above switch to NORM.
Corrective maintenance action should be performed prior to next flight.

g) MFD FAN ANNUNCIATOR ON
The illumination of the MFD FAN amber annunciator on the EFIS panel indicates the loss of the fan cooling the MFD. Since the loss of MFD has minor impact on flight safety no immediate action is required. The pilot should monitor the MFD operation and, in the event of any display abnormality, pull the MFD circuit breaker on the pilot circuit breaker panel.
Corrective maintenance action should be performed prior to next flight.

h) DPU FAN ANNUNCIATOR ON
The illumination of the DPU FAN amber annunciator on the EFIS panel indicates the loss of the fan cooling the DPU. To avoid possible loss of both EADI and EHSI the pilot should position the DRIVE XFER-NORM switch to DRIVE XFER and pull out the DPU 1 circuit breaker on the pilot circuit breaker panel. Following this action the MPU is used for driving the EADI and the EHSI.
Corrective maintenance action should be performed prior to next flight.

i) MPU FAN ANNUNCIATOR ON
The illumination of the MPU FAN amber annunciator on the EFIS panel indicates the loss of the fan cooling the MPU. The loss of cooling to the MPU does not involve any immediate hazard unless for long time operation in hot atmosphere. Thus the pilot should monitor the MFD indicator. In case of malfunction or if the airplane is requested to operate in high OAT conditions the pilot should pull out the MPU-L circuit breaker on the pilot circuit breaker panel in order to switch off the MPU and reduce cooling requirements in the nose bay. In such condition being the MFD not serviceable, also the MFD circuit breaker on the pilot circuit breaker panel should be pulled out.
Corrective maintenance action should be performed prior to next flight.

j) AVCS FAN FAIL ANNUNCIATOR ON
The illumination of the AVCS FAN FAIL amber annunciator on the annunciator panel indicates the loss of the main avionics cooling fan in the nose bay. Due to the presence of other two fans activated by thermal switches, this failure does not involve any hazard unless long time operation in hot atmosphere is required. The pilot should monitor the OAT indicator and switch off all non-essential avionics equipment if operation in high OAT conditions is required.
Corrective maintenance action should be performed prior to next flight.

k) DSP WARNING FLAG ON
The appearance of the DPS warning flag on the EADI and EHSI indicates the failure of the DSP. In such condition all controls on the DSP are unserviceable.

CAUTION

Last selections before DSP failure remain effective for both EADI and EHSI .
Autopilot lateral modes operation is limited to heading-hold only (vertical modes are not affected).

l) PIT/ROL/HDG COMPARATORS WARNING FLAGS AND EFIS MASTER RESET ANNUNCIATOR ON

CAUTION

Disagreement between attitude/heading sources has been detected.

PIT and ROL yellow flags appearing on the EADI indicate an excessive deviation between the primary and the secondary attitude references.
HDG yellow flag appearing on both EHSI and MFD indicates an excessive deviation between the primary and the secondary heading references.
As one (or more) comparator flag appears the EFIS MASTER RESET annunciator/ pushbutton on EFIS panel will flash until reset.
Messages on the displays will remain in view if the error is still present after such action. The pilot should identify the failed sensor by referring to the back-up instruments. Once the failed source has been identified the pilot should make, if necessary, the appropriate selection on the EFIS panel (by properly positioning the XSIDE ATT-NORM and the XSIDE HDG-NORM switches).

SECTION 4 – NORMAL PROCEDURES

NORMAL PROCEDURES CHECKLIST

a) BEFORE TAXI CHECKLIST

BAT switch - check BAT
GENERATOR switches - check L & R
EMER-NORM-BUS DISC switch - check NORM
INVERTERS switches - check PRI & SEC
AVIONICS switch - check ON
RADAR MODE selector - OFF or STBY
MFD PWR button - press
MFD INT - adjust
DRIVE XFER-NORM switch - NORM
EADI COMP-NORM-EFIS COMP switch - NORM
XSIDE ATT-NORM switch - NORM
XSIDE HDG-NORM switch - NORM
EADI BRT - adjust
EHSI BRT - adjust
DPU-MPU-EFD-MFD-FAN annunciator/pushbutton - press to test
EFIS test - perform
DRIVE XFER-NORM switch - DRIVE XFER
MFD screen - verify
EADI COMP-NORM-EHSI COMP - EADI COMP
EADI screen - verify
EADI COMP-NORM-EHSI COMP - EHSI COMP
EHSI screen - verify
DRIVE XFER-NORM switch - NORM
EADI COMP-NORM-EHSI COMP - NORM
XSIDE ATT-NORM - ATT
EADI - verify
XSIDE HDG-NORM - HDG
EHSI - verify
XSIDE selector switches - NORM
EFIS MASTER RESET - press
EFIS warning flags - check all OFF
STANDBY GYRO-HORIZON - check
AVCS FAN FAIL annunciator - check OFF

b) FLIGHT

CAUTION

V-bars on copilot ADI copy V-bars displayed on pilot EADI. Inconsistency may be found between ADI steering command and EHSI information on copilot side.

c) BEFORE SHUTDOWN CHECKLIST

RADAR MODE selector - OFF
MFD PWR button - OFF

AMPLIFIED NORMAL PROCEDURES

a) BEFORE TAXI

Before the first takeoff the pilot should perform all the "before taxi" checks listed herein, in addition to the "before taxi" checks listed in Section 4 of the Pilot's Operating Handbook.

The pilot should verify that the BAT switch is set to BAT position. The generator switches are set to L & R position. The EMERG-NORM-BUS DISC switch is set to NORM position. The AVIONICS switch is set to ON position and the INVERTER switches are set to PRI & SEC positions. The MFD (Multifunction Display) PWR switch should be selected on. After few seconds, to allow the warm-up, the pilot should adjust MFD display brightness acting on the INT knob. The pilot should also verify that the radar mode select, located on the weather radar panel, is in the OFF or STBY positions. On the EFIS panel pilot should set the DRIVE XFER-NORM switch to NORM position, the EADI COMP-NORM-EFIS COMP switch to NORM position, the XSIDE ATT-NORM switch to NORM position, the XSIDE HDG-NORM switch to NORM position. The EHSI and EADI brightness should be adjusted acting on the associated BRT knob.

CAUTION

Operating the EADI and EHSI instruments at maximum brightness (dim controls fully clockwise) for extended periods of time may eventually result in a condition known as "imprinting" on the crt. Imprinting is evidenced by being able to "see" an image on the crt when the crt is turned off, or by being able to "see" an image other than the one desired. This last condition usually occurs when, for example, a crt that was used as a EADI is removed from service and reinstalled as an EHSI, or vice versa. Consequently limit the operation at maximum brightness to the time strictly necessary.

The pilot should verify correct operation of the monitor units associated to the four EFIS fans and the main avionics bay fan controlling operation of the respective blower, pressing and holding the FAN annunciator/pushbutton. Consequently this, DPU, MPU, EFD and MFD sections of the FAN annunciator and the AVCS FAN FAIL amber light on the Annunciator Panel illuminate.

Release the FAN annunciator/pushbutton and verify all annunciators previously illuminated are OFF. Perform an EFIS test by positioning the SYST TEST selector to EFIS position and pressing and holding the central pushbutton. Subsequently this, an increment of 10 degrees of pitch up and roll right is added to the current values of pitch and roll displayed on the EADI, and an increment of 20 degrees is added to the EHSI compass rose. The comparator warning messages PIT, ROL and HDG should appear. After 4 seconds the attitude display is removed from view, heading is restored to the current value and all active flags associated with the EADI and EHSI are brought into view. Release SYST TEST button and reset the EFIS MASTER RESET.

Set the NORM-DRIVE XFER switch to DRIVE XFER position and verify EHSI data are displayed on MFD. Set the EADI COMP-NORM-EHSI COMP switch to EADI COMP position. Verify a composite format is displayed by the EADI and no picture on MFD and ESHI. Set the EADI COMP-NORM-EHSI COMP switch to EHSI COMP position. Verify a composite format is displayed by the EHSI and MFD whereas the EADI blanks. Return the DRIVE XFER-NORM switch to NORM position and the EADI COMP-NORM-EHSI COMP switch to NORM position.

Set the XSIDE-ATT-NORM switch to XSIDE position. Verify on EADI the attitude sensor annunciation ATT 2 is displayed.

Set the XSIDE HDG-NORM switch to XSIDE position. Verify on EHSI the heading sensor annunciation MAG2 is displayed. Verify on MFD the heading sensor annunciation changes from MAG 1 to MAG 2. Reposition the XSIDE ATT-NORM and XSIDE HDG-NORM switches to NORM position.

Press EFIS MASTER RESET annunciator and verify the annunciator is off and no warning flag is displayed by the EHSI or EADI.

Verify proper operation of the standby gyro-horizon and check the AVCS FAN FAIL annunciator (on the annunciator panel) is OFF.

b) FLIGHT

CAUTION

V-bars on copilot ADI copy V-bars displayed on pilot EADI.
Inconsistency may be found between ADI steering command and EHSI information on copilot side.

The V-bars of the copilot ADI will provide navigation and approach information generated by the EFIS and AP computers; these indications will differ from those shown on the copilot EHSI if separate frequencies are selected on NAV1 and NAV2 or different heading course references are inputed via EHSI panels.

The two positions switch "CMD BAR IN VIEW", "OUT OF VIEW", if installed above the copilot ADI, will enable or disable command bars display.

c) BEFORE SHUTDOWN
Before the engine shutdown the radar mode select switch on the radar control panel must be set to OFF position and the MFD should be set OFF by depressing the PWR switch.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 6 – WEIGHT AND BALANCE

Installation of the Collins EFIS-85B Electronic Fligth Instrument System is included in the weight and balance information presented in Section 6 of the Pilot's Operating Handbook.

SECTION 7 – SYSTEM DESCRIPTION AND OPERATION

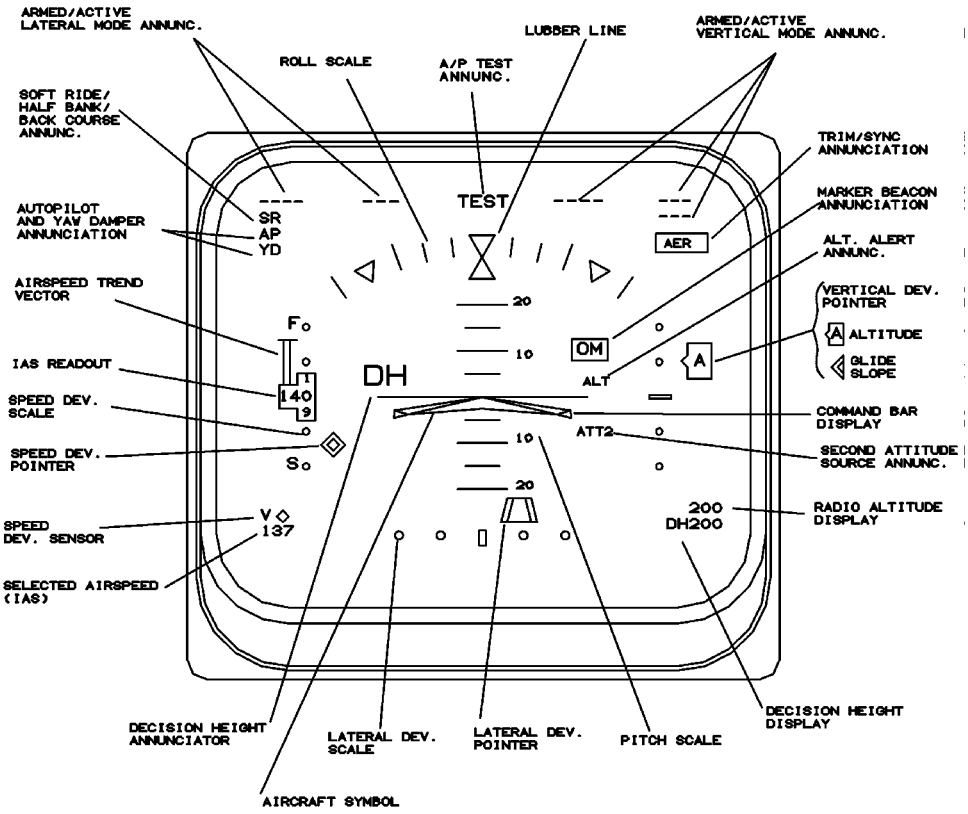
The EFIS-85B (Electronic Flight Instrument System) consists of three color CRT displays mounted in the cockpit. The EADI (Electronic Attitude Director Indicator) and the EHSI (Electronic Horizontal Situation Indicator) are mounted directly in front of the pilot with the EADI mounted above the EHSI. The MFD (Multifunction Display) is mounted in the center of the instrument panel between the engine instruments and the copilot's flight instruments.
System operation is controlled by the DSP (Display Select Panel mounted on the pedestal) and by the EFIS panel (mounted on the pilot side of the instrument panel) as well as by controls located on the MFD front panel.
The operation of Weather Radar (whose information may be displayed on MFD and/or EHSI) is controlled by the Weather Radar Panel, located below the MFD.
Two drive units, mounted in the avionics bay, process the information presented on the three displays. The DPU-85 (Display Processor Unit) is the main drive unit for the EADI and EHSI displays.
The MPU-85 (Multifunction Processor Unit) is the drive unit of the MFD in normal operation.
In the event of a DPU failure the MPU may substitute the DPU to drive the EADI and the EHSI.
Four blowers are provided to cool the system components: one cools the DPU, one cools the MPU, one cools both the EHSI and the EADI and one cools the MFD.

The installation of the EFIS system requires a third attitude indicator as a standby gyro. In the event of loss of the electrical power from the airplane DC system, this instrument is automatically powered by its own battery (emergency power unit): this condition is annunciated by the illumination of the EMER PWR light located just above the instrument.

EADI

The EADI is a multicolor display CRT that presents a plan view of the aircraft attitude situation.
A blue sky and a brown earth display is presented along with pitch and roll attitude markings in 5 degrees increments for pitch and 10 degrees increments for roll. A delta shaped airplane symbol is provided in the center of the display and "V" shaped command bars are in view when the flight director is used.
A radio altimeter readout is provided in the lower right corner of the display. The radio altitude is displayed only when the radio altitude system is within range (2500 feet), while the selected decision height is also provided in the lower right corner of the display with the letters "DH" to the left of the digit.
When the radio altitude is equal or less than the decision height selected a prominent "DH" flashing then steady is displayed in yellow near the center of the display.
Flight control system mode annunciation is displayed along the top of the display, vertical modes are shown to the right of the lubber line and lateral modes are shown to the left of the lubber line.
Active vertical and lateral modes/submodes are shown in green while the armed modes and submodes are displayed in white. See Figure 9-13 on page 9-61.
Autopilot/jaw damper annunciation is displayed in green in the upper left of the display as well as soft ride and half bank annunciations.
Indicated airspeed from the air data system is shown digitally at the left center of the display through a T-shaped window; the digits are replaced by dashes at airspeed below 30 knots.
Airspeed trend vector provides an indication of IAS acceleration when airborne. The trend vector extends upward or downward from the T-shaped box surrounding the IAS readout.
Speed deviation from the selected IAS (shown in the lower left corner) is displayed on the left center (just to the right of the IAS readout) and consists of a scale with four dots and a pointer. Letters "F" and "S" are located to the top and bottom data of the scale respectively.
The lateral deviation display located on the bottom center of the display indicates deviation from a selected navigation path. The display consists of a scale and an index.
When an approach is being flown and a localizer signal is usable, the pointer changes to a rising runway symbol after descending to a radio altitude of 200 feet.
At 200 feet of radio altitude runway symbol begins expanding both vertically and laterally until at 0 feet altitude the top edge of the runway symbol just touches the bottom edge of the aircraft symbol.

A scale and a pointer on the right side of the display indicates deviation from a selected altitude or glide path.
Altitude alert annunciation is also provided ("ALT", yellow) on the left side of the deviation index.
Marker beacon annunciations are displayed on the left of the vertical deviation scale.
Figure 9-12 shows the information displayed on the EADI.
The inclinometer or slip indicator consists of a weighed ball in a liquid-filled curved tube. It is attached to the lower front of the EADI and is used as an aid to coordinated maneuvres.



FM_9_12

Figure 9-12. EADI DISPLAY FORMAT

SECTION 7 – SYSTEM DESCRIPTION AND OPERATION

The EFIS-85B (Electronic Flight Instrument System) consists of three color CRT displays mounted in the cockpit. The EADI (Electronic Attitude Director Indicator) and the EHSI (Electronic Horizontal Situation Indicator) are mounted directly in front of the pilot with the EADI mounted above the EHSI. The MFD (Multifunction Display) is mounted in the center of the instrument panel between the engine instruments and the copilot's flight instruments.
System operation is controlled by the DSP (Display Select Panel mounted on the pedestal) and by the EFIS panel (mounted on the pilot side of the instrument panel) as well as by controls located on the MFD front panel.
The operation of Weather Radar (whose information may be displayed on MFD and/or EHSI) is controlled by the Weather Radar Panel, located below the MFD.
Two drive units, mounted in the avionics bay, process the information presented on the three displays. The DPU-85 (Display Processor Unit) is the main drive unit for the EADI and EHSI displays.
The MPU-85 (Multifunction Processor Unit) is the drive unit of the MFD in normal operation.
In the event of a DPU failure the MPU may substitute the DPU to drive the EADI and the EHSI.
Four blowers are provided to cool the system components: one cools the DPU, one cools the MPU, one cools both the EHSI and the EADI and one cools the MFD.

The installation of the EFIS system requires a third attitude indicator as a standby gyro. In the event of loss of the electrical power from the airplane DC system, this instrument is automatically powered by its own battery (emergency power unit): this condition is annunciated by the illumination of the EMER PWR light located just above the instrument.

EADI

The EADI is a multicolor display CRT that presents a plan view of the aircraft attitude situation.
A blue sky and a brown earth display is presented along with pitch and roll attitude markings in 5 degrees increments for pitch and 10 degrees increments for roll. A delta shaped airplane symbol is provided in the center of the display and "V" shaped command bars are in view when the flight director is used.
A radio altimeter readout is provided in the lower right corner of the display. The radio altitude is displayed only when the radio altitude system is within range (2500 feet), while the selected decision height is also provided in the lower right corner of the display with the letters "DH" to the left of the digit.
When the radio altitude is equal or less than the decision height selected a prominent "DH" flashing then steady is displayed in yellow near the center of the display.
Flight control system mode annunciation is displayed along the top of the display, vertical modes are shown to the right of the lubber line and lateral modes are shown to the left of the lubber line.
Active vertical and lateral modes/submodes are shown in green while the armed modes and submodes are displayed in white. See Figure 9-13 on page 9-61.
Autopilot/jaw damper annunciation is displayed in green in the upper left of the display as well as soft ride and half bank annunciations.

Speed deviation from the selected IAS (shown in the lower left corner) is displayed on the left center and consists of a scale with four dots and a pointer. Letters "F" and "S" are located to the top and bottom data of the scale respectively.
The lateral deviation display located on the bottom center of the display indicates deviation from a selected navigation path. The display consists of a scale and an index.
When an approach is being flown and a localizer signal is usable, the pointer changes to a rising runway symbol after descending to a radio altitude of 200 feet.
At 200 feet of radio altitude runway symbol begins expanding both vertically and laterally until at 0 feet altitude the top edge of the runway symbol just touches the bottom edge of the aircraft symbol.

A scale and a pointer on the right side of the display indicates deviation from glide path.

Marker beacon annunciations are displayed on the left of the vertical deviation scale.
Figure 9-12 on page 9-60 shows the information displayed on the EADI.
The inclinometer or slip indicator consists of a weighed ball in a liquid-filled curved tube. It is attached to the lower front of the EADI and is used as an aid to coordinated maneuvres.

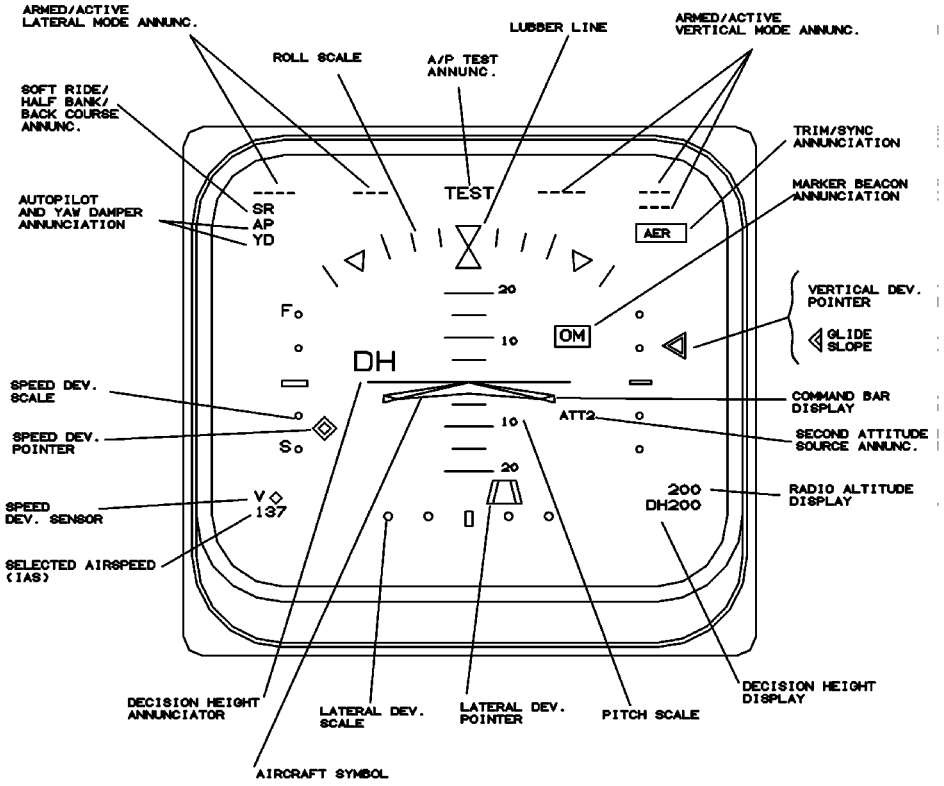


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Figure 9-12. EADI DISPLAY FORMAT

LATERAL MODES

VOR1	Nav mode, VOR arm (white) or capture (green)
LOC1	Nav mode, LOC arm (white) or capture (green)
DR	Dead Reckoning mode (green)
LVL	Roll hold mode (green)
HDG	Heading hold mode (green)
REV	Back Course mode (green)
(BLANK)	No lateral mode selected

VERTICAL MODES

GS	Nav mode, GS arm (white) or capture (green)
ALT	Altitude hold mode (green)
ALTS	Altitude select mode (green)
ALTS ARM	Altitude select mode armed (white)
GA	Go around mode (green)
IAS ***	IAS hold mode (green) showing reference IAS
MACH .**	Mach hold mode (green) showing reference Mach number
CLM ***0	Climb mode (green) showing rate of climb in feet per minute
DES ***0	Descend mode (green) showing rate of descent in feet per minute
VS ***0 ↑	Vertical speed mode (green) showing feet per minute up
VS ***0 ↓	Vertical speed mode (green) showing feet per minute down
(BLANK)	No vertical mode selected

OTHER ANNUNCIATIONS

AP	Autopilot engaged (green) or disengaged (yellow then off)
1/2 Φ	Half bank mode (green)
SR	Soft Ride mode (green)
YD	Yaw Damper engaged (green) or disengaged (yellow then off)
TEST	Autopilot system under test (white)
A	Mistrim on roll axis (yellow boxed)
E	Mistrim on pitch axis (yellow boxed)
R	Mistrim on yaw axis (yellow boxed)
SYNC	Autopilot SYNC operation (yellow)

NOTE

Lateral and Vertical Modes are annunciated respectively on the left and right side of the EADI
AP, SR, YD, and 1/2 Φ. annunciations are displayed on the left side of the EADI
TEST annunciation is displayed at the center of the upper side of the EADI (above the roll index)
A, E, R, and SYNC annunciations are displayed on the right side of the EADI

Figure 9-13. FCS MODE ANNUNCIATION

EHSI (ELECTRONIC HORIZONTAL SITUATION INDICATOR)

The EHSI is a multicolor display CRT that presents a plan view of the aircraft horizontal navigation situation. The three basic display mode of the EHSI are ROSE, APPR and ENR mode.
In the ROSE mode a full 360 degrees compass rose with letters at the cardinal points and numbers at the 30-degree marks is displayed. Aircraft heading is read against the lubber line. Markings are provided every 45 degrees around the perimeter of the card to aid in procedure turns.
An active course arrow, a bearing pointer, a heading cursor, a preset course display (a to/from arrow) and a lateral deviation bar are superimposed to the compass rose. On the periphery of the display a series of annunciators is provided.
Distance data from DME is provided on the left upper corner of the display and an H is annunciated if DME is in hold condition.
Active selected course sensor and preset course sensor annunciations are provided on the left side of display.
Bearing pointer sensor annunciation is provided on the left lower corner of the display.
Lateral deviation computation "LIN", "XTK", "ANG" and "B/C" annunciated on the upper part of the display to the right of the lubber line. The "B/C" annunciation is provided automatically when a localizer frequency is selected and a course more than 105 degrees from the lubber line is selected provided automatic left and right deviation correction for back course approaches.
Radar target alert annunciation (as well as turbulence alert annunciation, if the radar has such capability) is provided to the right of the lateral deviation computation.
A display of navigation data is provided on the upper right corner. The data displayed are: time-to-go, ground speed and elapsed time as selected on the display select panel. A vertical deviation display consisting of a scale and a pointer indicating glide slope deviation is provided on the right side. A digital readout of the active selected course is provided on the lower right corner of the display.
Figure 9-14 shows a typical ROSE format with the simbology appearing on the display.

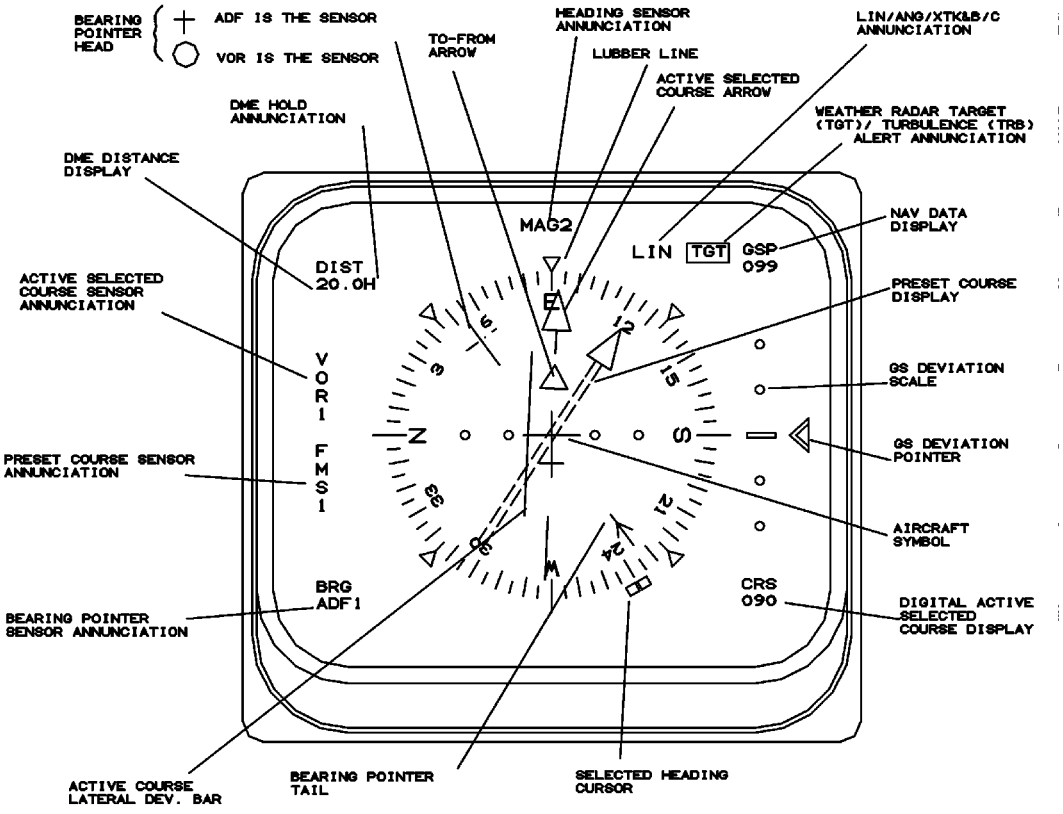
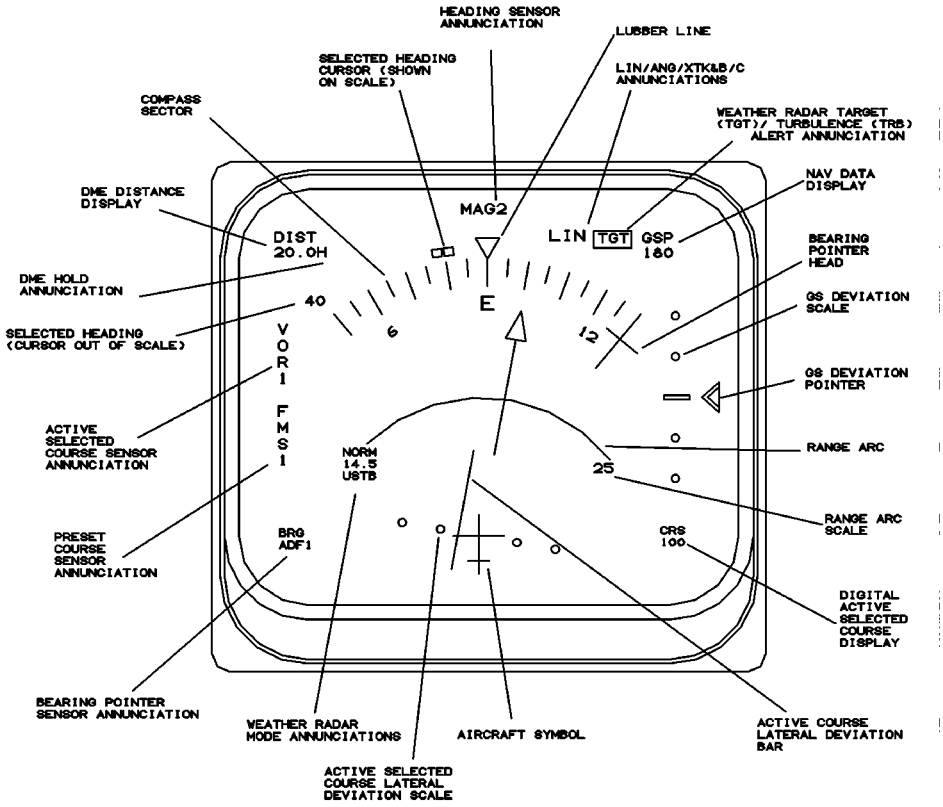


Figure 9-14. ROSE FORMAT

In the APPR mode the display will provide an expanded 80 degree compass sector with an airplane symbol at the base of the display. An active selected course lateral deviation bar is also shown to provide left/right deviation information. Only the "TO" end of indicator is displayed on approach mode. If the selected course is greater than 40 degrees left or right of the present heading the active course arrow will be out of view. Digital active selected course information is presented in the lower right hand corner of the display and remain in view regardless of whether the active selected course arrow is visible.
A selected heading cursor is shown by the location of two adjacent rectangles with respect to the compass sector when on scale. When the selected heading is out of scale the heading cursor disappears and is replaced by a digital readout above the appropriate end of the compass sector closest to the selected heading value.
A range arc when weather radar is not selected via the WX button on the DSP, is selected by acting on the RNG knob on the DSP. When WX button is pressed a radar information is added to the display and an indication of the selected radar mode, tilt data and stabilization annunciations appears below the left end of the range arc.
Figure 9-15 shows a typical APPR format with the symbology appearing on the display.



FM_9_15

Figure 9-15. APPR FORMAT

In the ENR mode all functions of the display are the same as described for the APPR mode but places the VOR symbols for both primary and secondary course in proper rho theta position with respect to the airplane symbol and selected range.

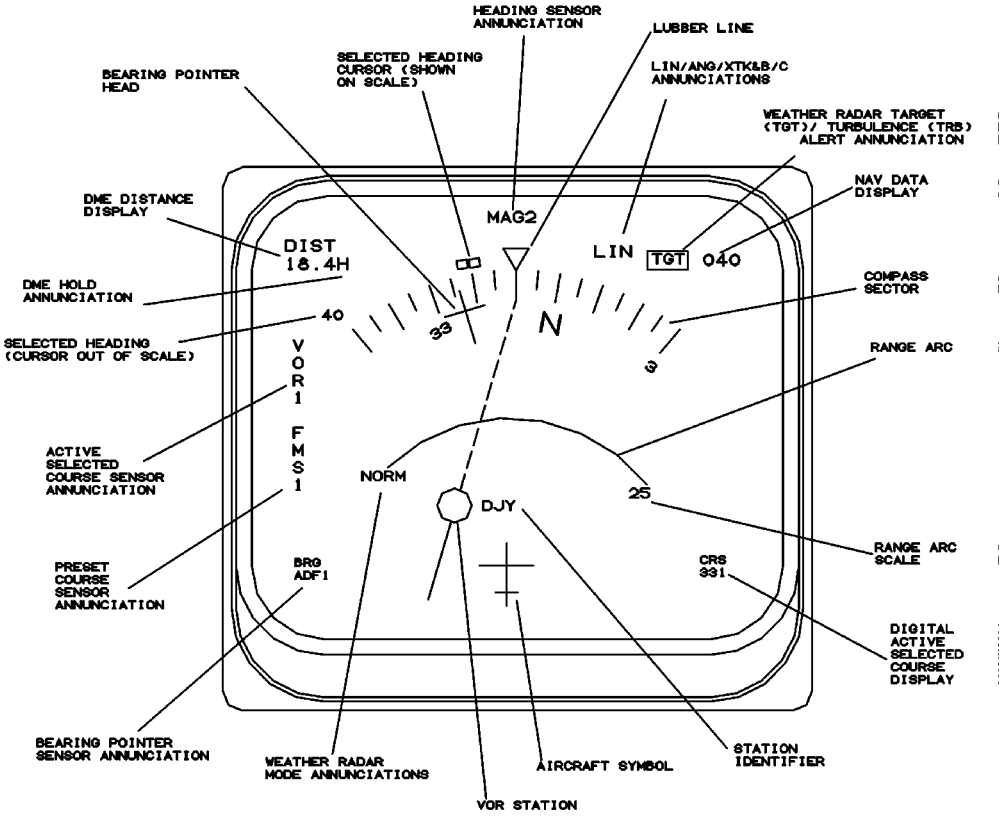


Figure 9-16. ENR FORMAT

COMPOSITE FORMAT

The composite format provides a combined image of the EADI with a small HSI sector superimposed over the lower portion of the screen. When selected the composite format EADI COMP-NORM-EHSI COMP to EADI COMP or EHSI COMP, the composite image is displayed on the selected display while the other one blanks.
The composite format is used in the event of a failure of one EFD.

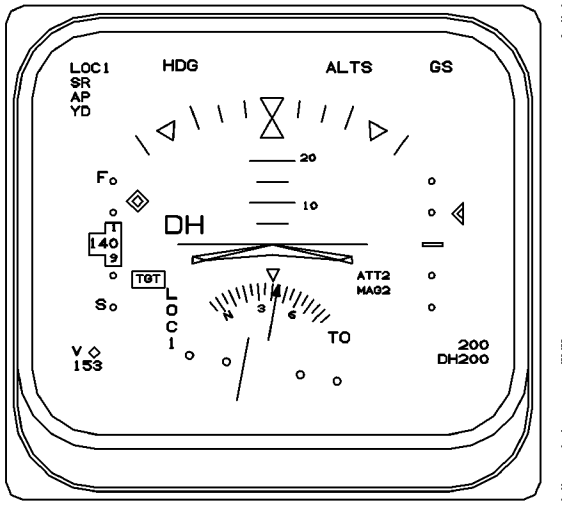
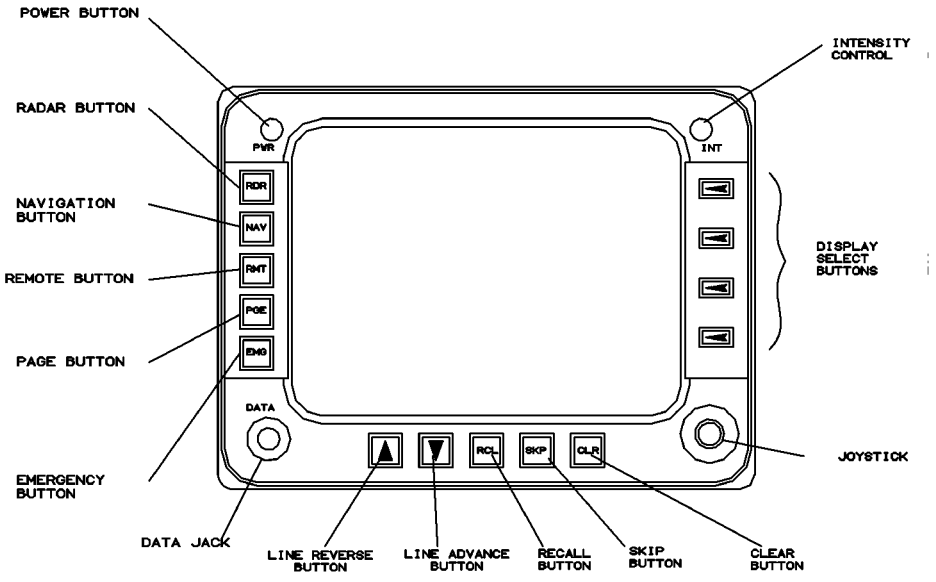


Figure 9-17. TYPICAL COMPOSITE FORMAT

MULTIFUNCTION DISPLAY (MFD)

The multifunction display located on the center of the instrument panel provides weather radar display, pictorial navigation maps and page data. In addition, when DRIVE XFER-NORM switch is set to DRIVE XFER position, MFD provides the same picture displayed by the EHSI.
The power switch on the top left corner of the display provides power to the display, while display intensity is controlled by the INT knob on the upper right corner.
The RDR button, when pressed, allows detectable weather to be displayed.
The NAV button, when pressed, allows navigation data to be selected and displayed.
The RMT button, when pressed, allows up to three remote sources of page data to be selected and displayed, one remote source at a time, or extended data pages to be shown.
The PGE or EMG buttons, when pressed, allow the user to select, to control and to entry alphanumeric information.
Data jack allows remote programming indexing and revision of page and emergency data.
The four unlabeled display select buttons on the right provide additional display control for navigation, page, emergency and remote modes of operation.
The "joystick" is a multiple position switch that may be used in NAV, RMT, PGE and EMG modes of operation.
In NAV mode the joystick locates an MFD defined waypoint for entry in a compatible LNAV system if installed.
In RMT mode the joystick may be used to slew through pages or chapters of data if the remote source is connected.
In PGE or EMG mode the joystick is used to view different chapters, titles and to move to new chapters.
The CLR button, when pressed, allows to reset all lines of a selected chapter to yellow when in the PGE or EMG mode.
The SKP button, when pressed, allows to move the cursor past a line in the PGE or EMG mode without changing its color.
The RCL button, when pressed, allows to view previously skipped lines when in the PGE or EMG mode.



FM_9_18

Figure 9-18. MULTIFUNCTION DISPLAY

COMPOSITE FORMAT

The composite format provides a combined image of the EADI with a small HSI sector superimposed over the lower portion of the screen. When selected the composite format EADI COMP-NORM-EHSI COMP to EADI COMP or EHSI COMP, the composite image is displayed on the selected display while the other one blanks.
The composite format is used in the event of a failure of one EFD.

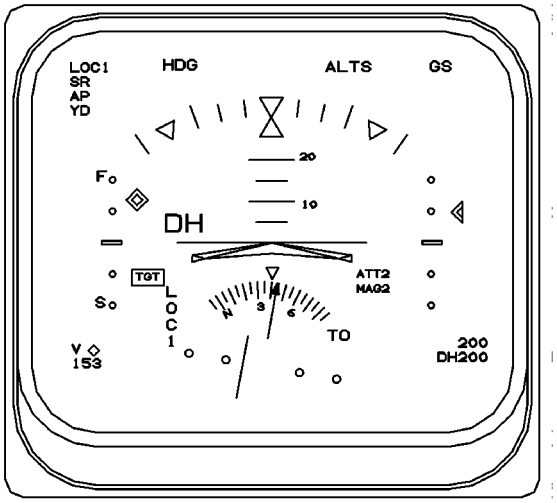


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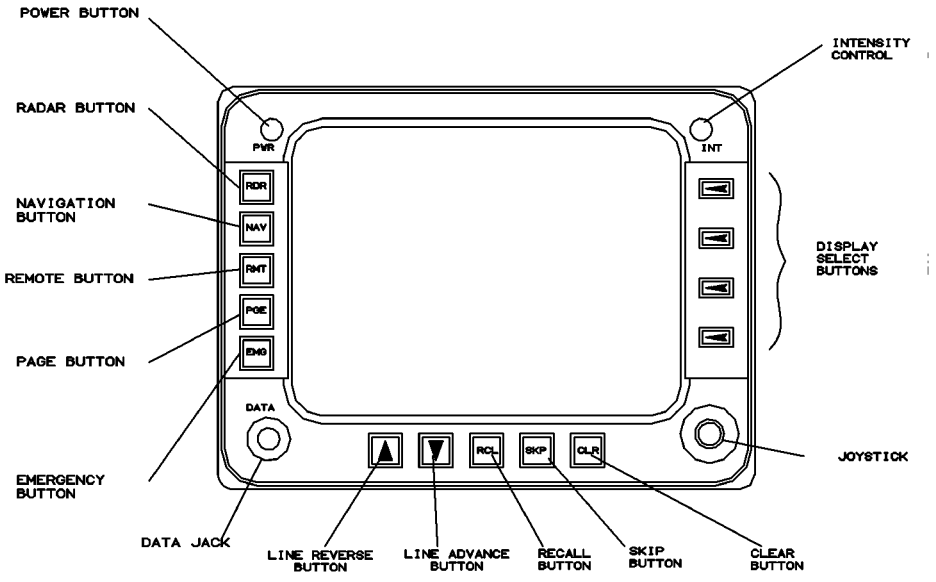
Figure 9-17. TYPICAL COMPOSITE FORMAT

MULTIFUNCTION DISPLAY (MFD)

The multifunction display located on the center of the instrument panel provides weather radar display, pictorial navigation maps and page data. In addition, when DRIVE XFER-NORM switch is set to DRIVE XFER position, MFD provides the same picture displayed by the EHSI.
The power switch on the top left corner of the display provides power to the display, while display intensity is controlled by the INT knob on the upper right corner.
The RDR button, when pressed, allows detectable weather to be displayed.
The NAV button, when pressed, allows navigation data to be selected and displayed.
The RMT button, when pressed, allows up to three remote sources of page data to be selected and displayed, one remote source at a time, or extended data pages to be shown.
The PGE or EMG buttons, when pressed, allow the user to select, to control and to entry alphanumeric information.
Data jack allows remote programming indexing and revision of page and emergency data.
The four unlabeled display select buttons on the right provide additional display control for navigation, page, emergency and remote modes of operation.
The "joystick" is a multiple position switch that may be used in NAV, RMT, PGE and EMG modes of operation.
In NAV mode the joystick locates an MFD defined waypoint for entry in a compatible LNAV system if installed.
In RMT mode the joystick may be used to slew through pages or chapters of data if the remote source is connected.
In PGE or EMG mode the joystick is used to view different chapters, titles and to move to new chapters.
The CLR button, when pressed, allows to reset all lines of a selected chapter to yellow when in the PGE or EMG mode.
The SKP button, when pressed, allows to move the cursor past a line in the PGE or EMG mode without changing its color.
The RCL button, when pressed, allows to view previously skipped lines when in the PGE or EMG mode.



FM_9_18

Figure 9-18. MULTIFUNCTION DISPLAY

RDR (RADAR) FORMAT

The RDR button, when pressed, allows weather to be displayed on the MFD in the form selected on the radar control panel. A second press of the RDR button removes the weather display and returns the display to the map format that was previously selected by the NAV menu.

The weather radar only format of the MFD has an aircraft symbol centered at the bottom of the display, and a digital heading readout centered at the top of the display. The heading type and sensor number (MAG 1 or MAG 2) is annunciated to the right of the digital heading display. A dashed range arc is shown at full range, and a solid range arc is shown at half of the selected range. Range is selected by the "RANGE" control on the radar control panel. The selected full scale range is shown at the right-hand end of the full-range arc, and half of the selected range is shown at the right-hand end of the half-range arc.

The radar mode of the MFD is indicated by the letters "RDR" adjacent to the RDR button. The weather radar "picture" extends from the aircraft symbol to the full range arc. Weather radar modes are shown at the left-hand end of the half-range arc when the RDR button is pressed, and in the upper left corner of the MFD when RDR is not selected.

When the target alert mode is selected on the radar control panel, the yellow boxed letters "TGT" appear at the left-hand end of the half-range arc when RDR is selected or in the upper left of the MFD when RDR is not selected.
If a turbulence/weather radar is installed and turbulence is detected the above annunciator alternates between "TGT" and "TRB".

NAV (NAVIGATION) FORMAT

Four pictorial navigation map formats are available on the MFD when the NAV button on the MFD has been pressed. The "heading up", the "north up with aircraft centered", and the "north up maximum view" formats are selected from the left side of the MFD's NAV menu, and the "map plan" format is available from a compatible LNAV if installed.
NAV, in green, is annunciated in the upper left corner of the MFD when the NAV button has been pressed. If RDR mode is not selected, the range is selected using the line advance or line reverse buttons on the MFD, and the range arcs or rings are dashed. If the radar control panel is on and RDR mode is also selected, the range is selected from the radar control panel and the half range arc is solid.
VOR stations as selected by the MFD NAV menu are shown by octagon-shaped symbols placed in proper rho-theta position with respect to aircraft heading and selected range. When a selected VOR course line is drawn through the station symbol, its position is controlled by the CRS knob on the DSP. The selected VOR course line may be rotated with the CRS knob on the DSP.
The course line is solid on the "to" side of the VOR and dashed on the from side. If the VOR symbol is off scale, the course line is drawn with an arrow pointing toward the station and an "ident" is shown on the line. The digital course and station ident are shown in the lower left corner. If the paired DME is placed in hold or fails, the VOR symbol and DME ident are removed and the sensor annunciator displays course if available, otherwise bearing is displayed.
If a VOR is selected for display with a localizer frequency tuned, no symbol is displayed and the sensor annunciator displays LOC and selected course. The colors for these annunciator are the same as the active course annunciator on the EHSI.

NAV FORMAT, NAV MENU

The NAV menu allows the pilot to change the displayed navigation mode and select various navigation features.
The NAV menu is called up by first pressing the NAV button, and then pressing the upper right line select key which is identified by a boxed arrow pointing to that line select key. Pressing this key displays a selection menu with key labels on the left of "RADAR", "HEADING UP", NORTH UP-A/C CNTR, "NORTH UP-MAX VIEW" and "EMERGENCY". Key labels on the right are "VOR1/VOR2", "FMS1/FMS2", and "HDG".

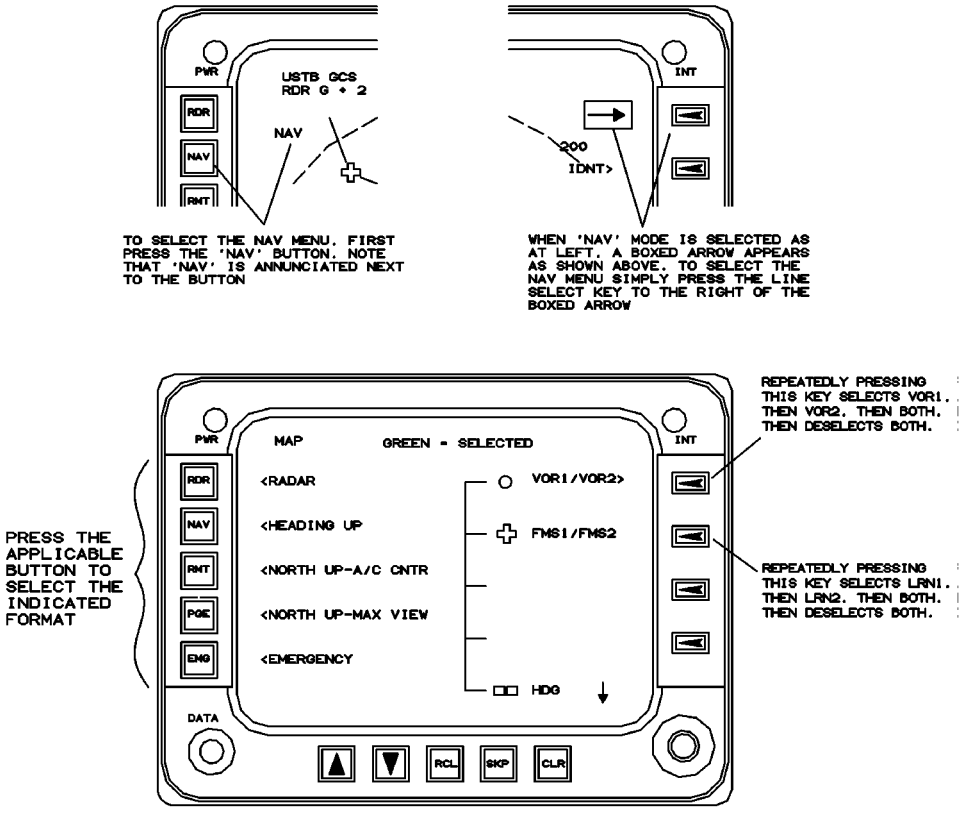


Figure 9-19. NAV MODE - NAV MENU

NAV MODE, HEADING UP FORMAT

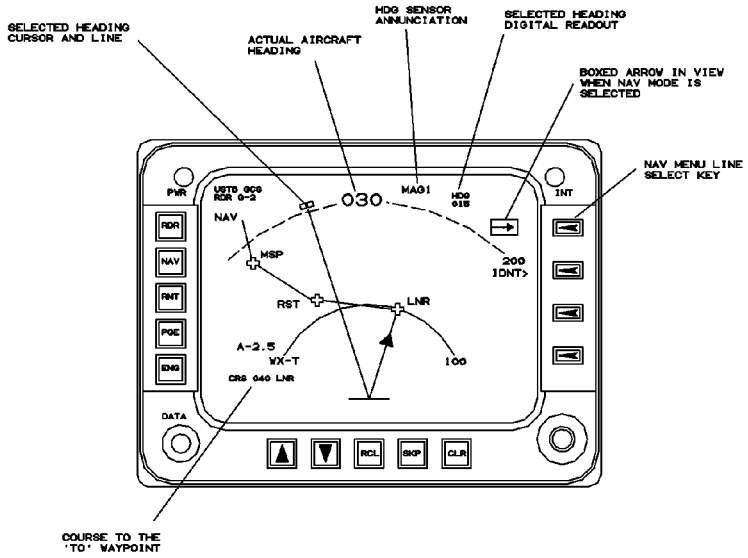
Pressing the "HEADING UP" button on the NAV menu allows the heading up format to be displayed. To return to the NAV menu, press the line select key next to the boxed arrow.
The heading up format has the aircraft symbol centered at the bottom of the display, and a digital heading readout centered at the top of the display.
The heading type and sensor number (MAG 1 or MAG 2) is annunciated to the right of the digital heading display.

No compass arc is shown across the top of the display. Instead, two dashed range arcs are shown, one at full range, and one at half of the selected range. The range is selected using the MFD's line advance or line reverse keys. The full scale range is shown at the right-hand end of the full-range arc, and half of the selected range is shown at the right-hand end of the half-range arc.

The magenta selected heading display (cursor, selected heading line, and digital selected heading readout), may also be shown if selected from the NAV menu. The position of the selected heading cursor and line is controlled by the HDG knob on the DSP. Other display features (VOR/DME stations, waypoints) are selected from the right side of the NAV menu.

Pressing the RDR button on the MFD allows weather radar information to be superimposed on the heading up format in the form selected on the radar control panel. When RDR is selected, the half-range arc changes from dashed to a solid arc. A second press of the RDR button removes the weather radar information from the display.

Pressing the NAV button removes the navigation information including the dashed half-range arc. Pressing the NAV button again causes the navigation information to reappear.



FM_9_20

Figure 9-20. NAV MODE, HEADING UP FORMAT

NAV MODE, NORTH UP WITH AIRCRAFT CENTERED FORMAT

Pressing the "NORTH UP-A/C CNTR" button on the NAV menu allows the north up with aircraft centered format to be displayed. To return to the NAV menu, press the line select key next to the boxed arrow.
The north up with aircraft centered format always has magnetic north at the top center of the display. North up is annunciated with an "N" above an upward pointing arrow. The white aircraft symbol is located in the center of the display and the symbol rotates as the heading of the aircraft changes. The nose of the aircraft symbol shows the aircraft's heading.
The heading type and sensor number (MAG 1 or MAG 2) and a digital heading display are shown to the right of the north up ("N") annunciation.
Two dashed range rings having the aircraft symbol as their center are displayed. One is shown at full range, and one is shown at half of the selected range. The range is selected using the MFD's line advance or line reverse keys. The selected full scale range is shown at the right side of the full range ring, and half of the selected range is shown at the right side of the half range ring.
Pressing the RDR button on the MFD returns the display to the heading up format with weather radar information displayed in the form selected on the radar control panel. A second press of the RDR button removes the weather radar information and returns the display to the previously selected north up with aircraft centered format.
Pressing the NAV button on the MFD removes the navigation information (symbols, course lines, etc.) and changes the display to a north up sector format with the digital heading display located to the right of the heading annunciator. A dashed half-range ring is not displayed when the display changes to a north up sector format. Pressing the NAV button again causes the navigation information to reappear and returns the display to the north up with aircraft centered format.

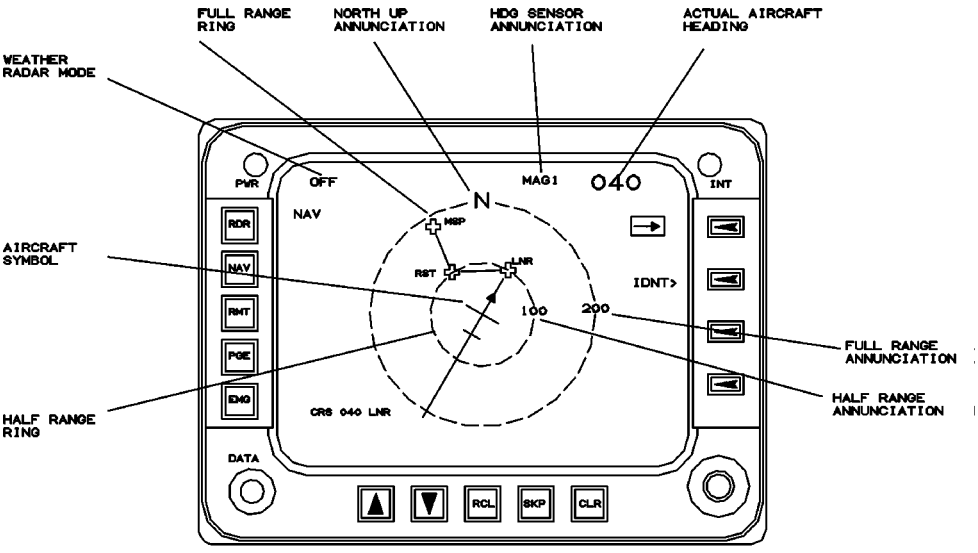


Figure 9-21. NAV MODE, NORTH UP WITH AIRCRAFT CENTERED FORMAT

NAV MODE, NORTH UP MAXIMUM VIEW FORMAT

Pressing the "NORTH UP-MAX VIEW" button on the NAV menu allows the north up maximum view format to be displayed. To return to the NAV menu, press the line select key next to the boxed arrow.
The north up maximum view format always has magnetic north centered at the top of the display. North up is annunciated with an "N" above an upward pointing arrow. The white aircraft symbol is positioned on an imaginary circle near the edge of the display so that the greatest amount of area is shown in front

of the aircraft. The aircraft symbol is positioned on the current aircraft track with the nose of the aircraft always pointing toward the center of the display.
The heading type and sensor number (MAG 1 or MAG 2) and a digital heading display are shown to the right of the north up ("N") annunciation.
Two dashed range arcs having their center of curvature at the aircraft symbol are displayed. One is shown at full range, and one at half of the selected range. The range is selected using the MFD's line advance or line reverse keys. The selected full scale range is shown at the full range ring, and half of the selected range is shown at the half range ring. Other display features (VOR/DME stations, waypoints) are selected from the right side of the MFD's NAV menu.
Pressing the RDR button on the MFD returns the display to the heading up format with weather radar information displayed in the form selected on the radar control panel. A second press of the RDR button removes the weather radar information and returns the display to the previously selected north up maximum view format.
Pressing the NAV button on the MFD removes the navigation information (symbols, course lines, etc.) and changes the display to a north up sector format with the digital heading display located to the right of the heading annunciator. A dashed half-range ring is not displayed when the display changes to a north up sector format. Pressing the NAV button again causes the navigation information to reappear and returns the display to the north up maximum view format.

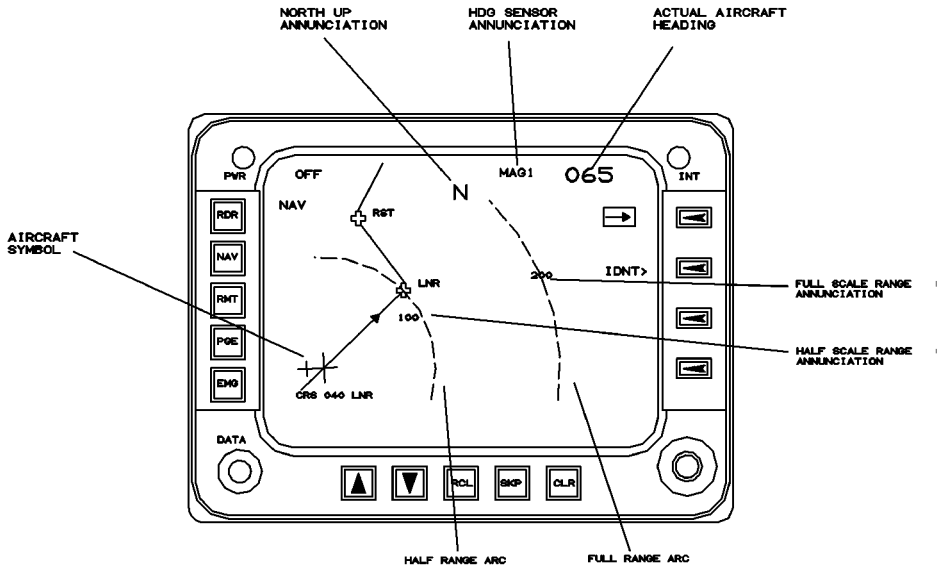


Figure 9-22. NAV MODE, NORTH UP MAXIMUM VIEW FORMAT

DISPLAY SELECT PANEL (DSP)

The display select panel provides the pilot with the controls needed to select the various operating formats and functions of the EHSI. The DSP also provides DH SET and RA TST (radio altimeter test) facilities.
The unit, installed on the aft control pedestal, embodies the following controls:

FORMAT selector three-position switch

a. ROSE - In the ROSE position the full compass rose format is displayed.
b. APPR - In the APPR position an expanded compass segment across the top of the display with the airplane symbol centered at the bottom is displayed.

Information displayed in this mode is similar to that presented in the ROSE mode. Weather radar information may also be displayed in this format.

c. ENR - In the ENR position VOR and/or waypoint symbols for both active selected course and preset second course in proper rho-theta position with respect to airplane symbol and selected range superimposed to the expanded compass segment are displayed. Weather radar information may also be displayed in this format.

RNG knob — The RNG knob concentric with respect to the FORMAT switch selects range of the dashed cyan range arc. Available full scale ranges are 5, 10, 25, 50, 100, 200, 300 and 600 nmi.

CRS (course) selector

Three-position switch selects the navigation sensor driving the active selected course arrow.

CRS (course select) knob

The knob provides the control of active selected course arrow.

PUSH CRS DIRECT (course direct to) button

The button concentric with respect to the CRS knob. When pushed, if a VOR is the navigation sensor being displayed by the active selected course arrow, the course arrow rotates directly toward the station until the VOR deviation is zeroed.

NAV DATA button

The button provides sequential display of TTG (time-to-go), GSP (Ground Speed) or ET (Elapsed Time) in the upper right corner of the EHSI.

2ND CRS button

The second course button, when pressed, allows the second navigation sensor to be displayed on the EHSI. This function is allowed with Flight Management System only.

WX button — The weather radar button, when pressed, causes weather radar information to appear on the EHSI when APPR or ENR formats are being displayed and WX or WX + T are selected on the radar panel.

BRG (Bearing) selector

The five-position switch selects the navigation sensor driving the EHSI bearing pointer.

HDG (Heading Select) knob

The knob provides the control of the EHSI heading cursor.

PUSH HDG SYNC button

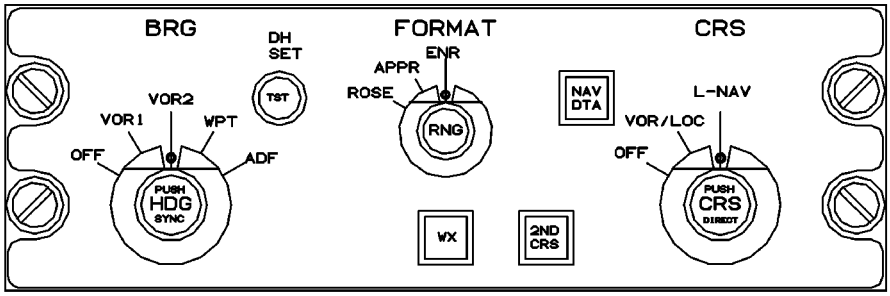
The button, concentric with respect to the HDG knob, when pushed, causes the heading cursor to rotate and match the aircraft heading shown under the lubber line.

DH SET (decision height set) knob

The knob, when actuated, sets the decision height shown in the lower right corner of the EADI.

TST (radio altimeter test) button

The button (part of the DH SET knob), when pressed, sets the radio altimeter in test mode.



FM_9_23

Figure 9-23. DISPLAY SELECT PANEL

EFIS PANEL

The EFIS panel, mounted on the instrument panel pilot section, is a means to control and monitor system operation.
The unit embodies the following controls and annunciators:

a) the DRIVE XFER-NORM two-position switch, when DRIVE XFER position is selected, causes signals driving EHSI, EADI and autopilot (that in normal conditions are generated by the DPU) to be generated by the MPU. When this position is selected, the MFD displays the same format of the EHSI.

b) the EADI COMP-NORM-EHSI COMP three-position switch, when set to EADI COMP or EHSI COMP, provides on the selected display a composite format.

c) the X-SIDE two-position switches enable, when set to ATT or HDG position respectively to select the secondary attitude and heading sensors.

d) the EADI BRT provides an adjustable intensity control for the EADI display.

e) the EHSI BRT provides an adjustable intensity control for the EHSI display.

Refer to the "EFIS PANEL ANNUNCIATORS" paragraph for the description and operation of the EFIS MASTER RESET and FAN annunciators/push buttons.

EFIS ET (ELAPSED TIME) BUTTON

a) the EFIS ET button located on the inboard horn of the pilot control wheel provides a means to control timer. The timer has three modes: reset, start and stop. Each time the EFIS ET button is pressed, the timer advance to the next mode in sequence. Stopping the timer holds the present count on the display until the timer is reset again.

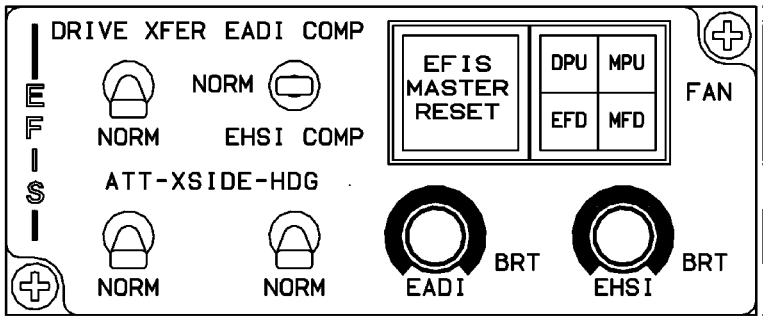


Figure 9-24. EFIS PANEL

WARNING FLAGS

EADI Warning Flags

a) ATTITUDE FLAG
If a failure of the attitude sensor is detected, the pitch scale, roll scale, roll pointer, ski/ground display, and command bars disappear and a red box with the letters "ATT" inscribed appears above the aircraft symbol. The ATT flag remains in view until an alternate sensor is selected or until the fault is cleared.

b) DISPLAY OR MULTIFUNCTION PROCESSOR UNIT (DPU or MPU) FLAG
If the DPU fails, the non-flashing inscription "DPU FAIL" appears in red centered on the display. If the EADI is being driven by the MPU, the flag is "MPU FAIL". If either flag remains in view more than 5 seconds, the entire display blanks except for the DPU or MPU flag.

c) VERTICAL DEVIATION FLAGS
If a failure of the glideslope receiver is detected, a red box with the letters "GS" inscribed appears to the left of the vertical deviation scale. The pointer and scale are not removed from view. If an air data failure is detected, the scale and pointer are removed from view and replaced by a red box with the letters "ALT" inscribed.

d) RADIO ALTIMETER FLAG
If a failure of the radio altimeter is detected, the radio altitude display is replaced by a red box with the letters "RA" inscribed. The DH set display and the DH annunciator are also removed from view.

e) DISPLAY SELECT PANEL FLAG
If a failure of the display control panel occurs, a red box with the letters "DSP" inscribed appears in the lower right corner replacing the DH set display. Flight control system mode annunciators that are derived from the DSP are also removed from view. The EFIS-85B continues to operate in the mode that was active prior to the DSP failure.

f) LATERAL DEVIATION FLAGS
If a sensor failure is detected by loss of the valid or by an internal monitor, the appropriate red letters "LOC" or "VOR" appear above the scale. The scale and pointer remain in view if the valid signal from the sensor is lost.

g) CROSS-SIDE DATA FLAG
If a failure of the cross-side data bus occurs, a red box with the letters "XDTA" inscribed appears in the lower left of the EADI. Data from the cross-side sensor is no longer available, and any display driven by cross-side data is flagged. This flag always appears if MPU fails.

h) SPEED DEVIATION FLAG
If the digital air data system failure is detected, the speed deviation scale and pointer disappear and a red boxed "SPD" annunciation is displayed on the left side of the EADI.

i) FLIGHT DIRECTOR FLAG
if the flight director system fails, the command bars disappear and a red box with the letters "FD" inscribed appears at the lower left of the aircraft symbol.

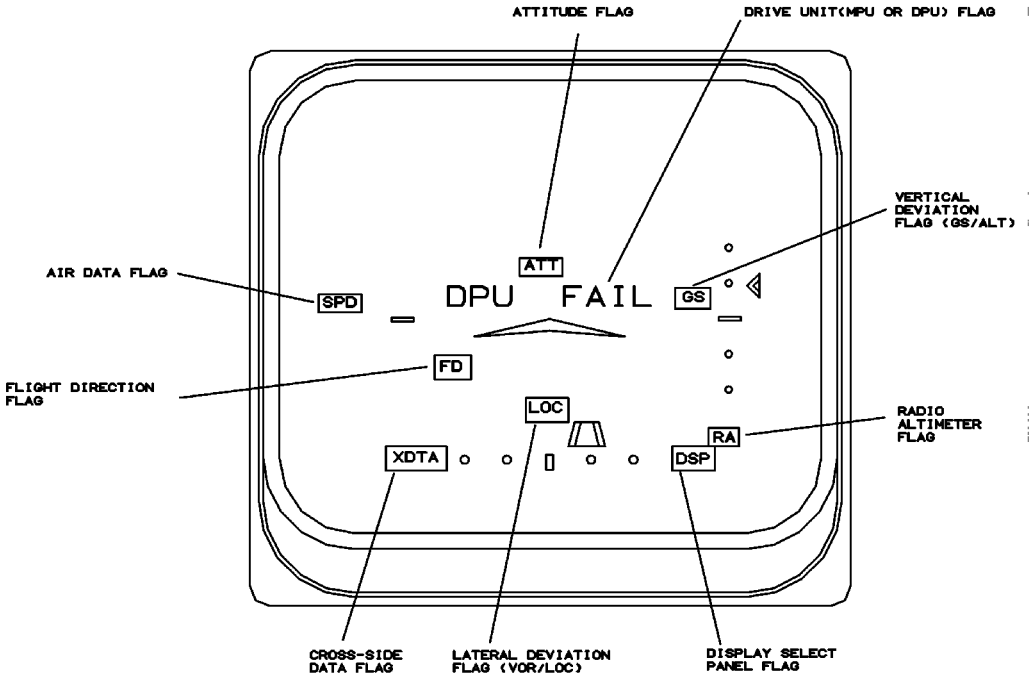


Figure 9-25. EADI WARNING FLAGS

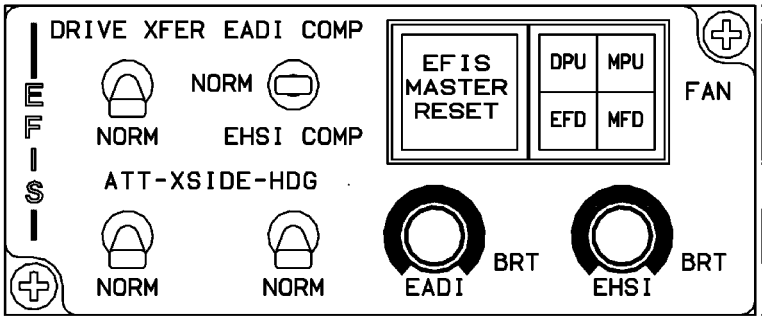


Figure 9-24. EFIS PANEL

WARNING FLAGS

EFIS PANEL EADI Warning Flags

a) ATTITUDE FLAG
If a failure of the attitude sensor is detected, the pitch scale, roll scale, roll pointer, ski/ground display, and command bars disappear and a red box with the letters "ATT" inscribed appears above the aircraft symbol. The ATT flag remains in view until an alternate sensor is selected or until the fault is cleared.

b) DISPLAY OR MULTIFUNCTION PROCESSOR UNIT (DPU or MPU) FLAG
If the DPU fails, the non-flashing inscription "DPU FAIL" appears in red centered on the display. If the EADI is being driven by the MPU, the flag is "MPU FAIL". If either flag remains in view more than 5 seconds, the entire display blanks except for the DPU or MPU flag.

c) VERTICAL DEVIATION FLAGS
If a failure of the glideslope receiver is detected, a red box with the letters "GS" inscribed appears to the left of the vertical deviation scale. The pointer and scale are not removed from view. If an air data failure is detected, the scale and pointer are removed from view and replaced by a red box with the letters "ALT" inscribed.

d) RADIO ALTIMETER FLAG
If a failure of the radio altimeter is detected, the radio altitude display is replaced by a red box with the letters "RA" inscribed. The DH set display and the DH annunciator are also removed from view.

e) DISPLAY SELECT PANEL FLAG
If a failure of the display control panel occurs, a red box with the letters "DSP" inscribed appears in the lower right corner replacing the DH set display. Flight control system mode annunciators that are derived from the DSP are also removed from view. The EFIS-85B continues to operate in the mode that was active prior to the DSP failure.

f) LATERAL DEVIATION FLAGS
If a sensor failure is detected by loss of the valid or by an internal monitor, the appropriate red letters "LOC" or "VOR" appear above the scale. The scale and pointer remain in view if the valid signal from the sensor is lost.

g) CROSS-SIDE DATA FLAG
If a failure of the cross-side data bus occurs, a red box with the letters "XDTA" inscribed appears in the lower left of the EADI. Data from the cross-side sensor is no longer available, and any display driven by cross-side data is flagged. This flag always appears if MPU fails.

h) FLIGHT DIRECTOR FLAG
if the flight director system fails, the command bars disappear and a red box with the letters "FD" inscribed appears at the lower left of the aircraft symbol.

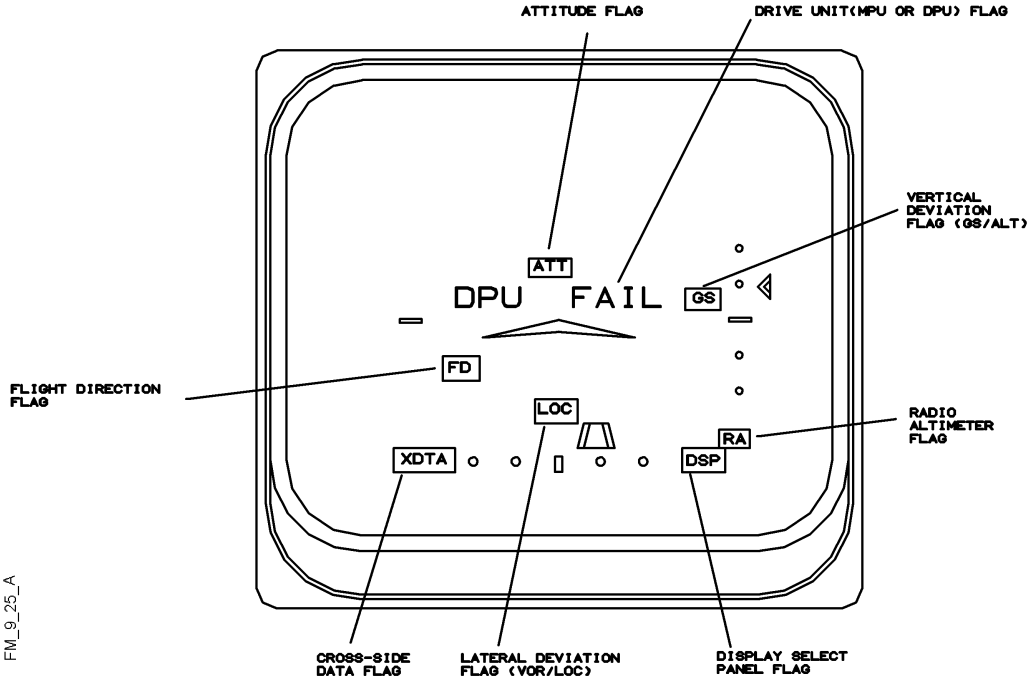


Figure 9-24. EADI WARNING FLAGS

EHSI Warning Flags

a) DISTANCE FLAG
If invalid distance data is detected from a DME, the distance digits are replaced with dashes that are the same color as the active course display. If the digital bus monitor detects an inactive bus, the data or dashes are removed from the display.

b) HEADING FLAG
If a failure of the active heading system occurs, a red box with the letters "HDG" inscribed and a failed sensor annunciation (HDG 1 or HDG 2), appear in the upper side of the display. If the heading synchro or bus monitor detects a failure, the HDG flag appears and the compass card is frozen in position. Nothing is removed from the EHSI when a HDG flag appears.

c) DISPLAY OR MULTIFUNCTION PROCESSOR UNIT (DPU or MPU) FLAG
If the DPU fails, the non-flashing inscription "DPU FAIL" appears in red centered on the display. If the EHSI is being driven by the MPU, the flag is "MPU FAIL". If either flag remains in view more than 5 seconds, the entire display blanks except for the DPU or MPU flag.

d) NAV DATA FLAGS
If invalid time-to-go, or ground speed is detected, the digits are replaced with dashes that are the same color as the active course display. If the digital bus monitor detects an inactive bus, the data or dashes are removed from the display.

e) GLIDE SLOPE DEVIATION FLAGS
If a failure of the glideslope receiver is detected, a red box with the letters "GS" inscribed appears and the scale and pointer remain in view.

f) DISPLAY SELECT PANEL FLAG
If a failure of the display control panel occurs, a red box with the letters "DSP" inscribed appears in the lower right corner replacing the digital selected course readout. The EFIS-85B continues to operate in the mode that was active prior to the DSP failure.

g) BEARING POINTER FLAG
If a bearing pointer sensor failure occurs, the sensor annunciation becomes red and boxed, and the bearing pointer is removed from view, but the letters "BRG" remain in view.

h) ACTIVE SELECTED COURSE FLAG
If a navigation sensor failure is detected while it is selected for the active selected course, the active selected course sensor annunciator becomes red and boxed.

If VOR valid is lost, nothing is removed from the display except the VOR bearing and the to/from display, while the deviation bar centers.

i) PRESET COURSE FLAG
If the preset course navigation sensor fails the associated annunciation, to the left side of the display becomes red and boxed (provided that second course is selected)

j) CROSS-SIDE DATA FLAG
If a failure of the cross-side data bus occurs, a red box with the letters "XDTA" inscribed appears in the lower left of the EADI. Data from the cross-side sensor is no longer available (as well as comparator function), and any display driven by cross-side data is flagged.

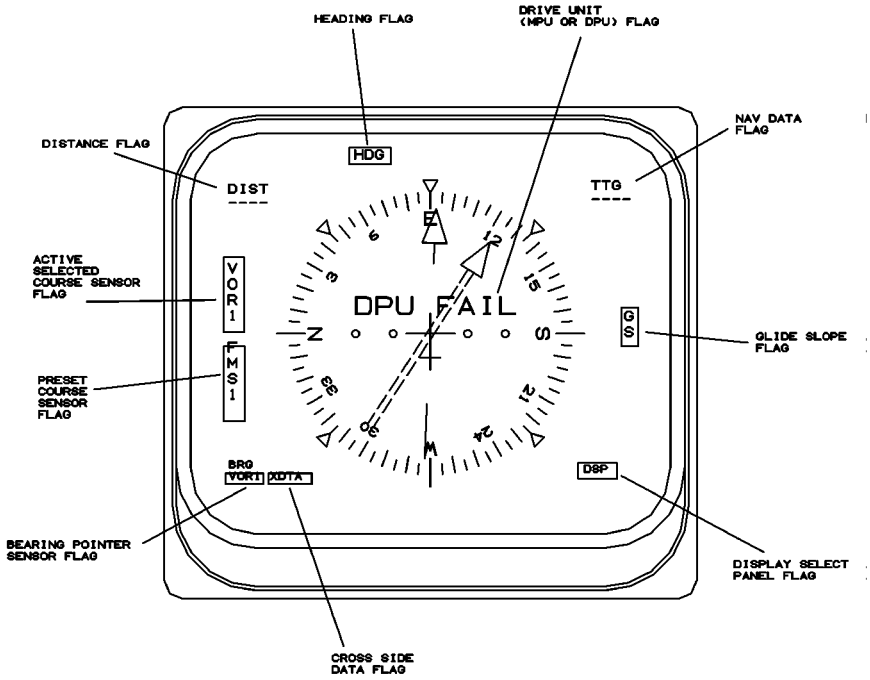


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Figure 9-26. EHSI WARNING FLAGS

MFD WARNING FLAGS

a) HEADING FLAG
If a failure of the active heading system occurs, a red box with the letters "HDG" inscribed and a failed sensor annunciation (HDG 1 or HDG 2), appear in the upper side of the display. If the heading synchro or bus monitor detects a failure, the HDG flag appears and the compass card is frozen in position. Nothing is removed from the MFD when a HDG flag appears.

b) MULTIFUNCTION PROCESSOR UNIT (MPU) FLAG
If the MPU fails, the red "MPU FAIL" flag is displayed to the center of the MFD and then the display blanks.

c) NAVIGATION SENSORS FLAGS
A red boxed flag appears on the MFD in the event of failure of the navigation sensor whose information is displayed.

COMPARATOR WARNING FLAGS

Comparator monitoring is performed in the DPU and MPU. When a sensor conflict is detected, an annunciation is provided on EFIS panel on EHSI and EADI. Direction sensors conflict is monitored by the letters "HDG" boxed yellow appearing to the left of the lubber line.
Attitude sensor conflict is monitored by the letter "PIT" and "ROL" boxed yellow appearing in the lower left of the display: PIT, if a conflict is detected on the pitch channel, or ROL if a conflict is detected in the roll channel.
When the above mentioned comparator warning appears, it flashes for 10 seconds and then becomes steady. The error message can be eliminated by pressing the face of the EFIS MASTER RESET annunciator if the comparator error is no longer present.

EFIS PANEL ANNUNCIATORS

The EFIS MASTER RESET annunciator/pushbutton comes on when a comparator flag PITROL or HDG is in view. An integral switch, operated by pressing the face of the annunciator, allows to reset the warning annunciation.
The FAN annunciator/pusbutton, divided in four sections labeled DPU-MPU-EFD-MFD, monitors the four fans operation:

- The DPU section monitors operation of the fan cooling DPU.
- The MPU section monitors operation of the fan cooling MPU.
- The EFD section monitors operation of the fan cooling EADI and EHSI.
- The MFD section monitors operation of the fan cooling MFD.

The annunciator, when pressed, performs the test of the four fan monitor module.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 4 FOR THE BENDIX/KING KNS 660 MULTISENSOR AREA NAVIGATION SYSTEM

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Bendix/King KNS 660 Flight Management System is installed with the EFIS-85B System. The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The KNS 660 is a Multisensor Area Navigation System consisting of a cockpit mounted control display unit (CDU), a remote-mounted navigation computer (with an internal OMEGA/VLF sensor) interfaced with the Primary VOR/DME, and an OMEGA/VLF H-Field antenna.
Additionally, the KNS 660 can be interfaced with an optional GPS sensor and/or an optional Rubidium Frequency Standard oscillator.

SECTION 2 – LIMITATION

a) Prior to flight, whenever navigation is predicated on the use of the KNS 660, the flight crew must identify by CDU readout (on the Self Test page displayed at power on) the level of Operational Revision Status (ORS) and verify the applicable Pilot's Guide is available for use (for ORS06 the Bendix/King KNS 660 Pilot's Guide P/N006-8407-00 dated Jan.18, 1988 or later revision, must apply).

b) Check, by CDU readout, the date recommended for Data Base (D/BASE) updating. If the KNS 660 Data Base has expired, IFR navigation is prohibited unless the pilot verifies each selected waypoint and navaid for accuracy by reference to current approved data.

c) The KNS 660 is approved for VFR/IFR RNAV charted enroute, terminal area, and approach operation.

d) During RNAV operations additional navigation equipment required for the specific type of operation must be installed and operable.

e) The computed position must be checked for accuracy (reasonableness) prior to use as means of navigation and under the following conditions:

   1) Prior to each compulsory reporting point during IFR operation when not under radar surveillance or control.
   2) At or prior to arrival at each enroute waypoint during RNAV operation along approved RNAV routes.
   3) Prior to requesting off-airway routing, and at hourly intervals thereafter during RNAV operation off approved RNAV routes.

f) Whenever the accuracy check reveals a KNS 660 error of greater than 2NM, the KNS 660 must be updated to satisfy RNAV ENROUTE requirements.

g) Navigation cannot be predicated on the use of VLF/OMEGA guidance while in terminal areas or during departures from or approaches to airports or into valleys; e.g. between peaks in mountainous terrain or below Minimum Enroute Altitude (MEA).

h) During periods of Dead Reckoning (DR), navigation shall not be predicated on the use of the KNS 660 as a means of RNAV operation.

i) Following a period of Dead Reckoning (DR), the aircraft position should be verified and updated, as required, by visually sighting ground reference points and/or by using other installed navigation equipment such as VOR or DME.

j) When operating outside the magnetic compass Variation Area (North of 70° North latitude or South of 60° South latitude) the pilot must manually insert magnetic variation.

k) The KNS 660 with only OMEGA/VLF sensor operable is approved for VFR operations, provided the system is receiving adequate usable signals.

l) The GPS sensor is not approved for navigation as a stand-alone sensor. The GPS sensor input is designed to enhance any other sensor(s) input resulting in the composite position output.

m) Navigation should not be predicated on the KNS 660 System when a NAV flag is visible. Following a period (5 minutes or more) of invalid operation (NAV flag visible), the KNS 660 System position must be verified and updated as required.

n) Navigation Data Base (D/BASE) limitations:

1) The D/BASE must be updated to the latest revision every 28 days. Updating shall be accomplished with Bendix/King update diskette or equivalent. Update diskettes will be received by mail to subscribers several days before the effective date of revision.

2) The D/BASE loading/updating shall be performed following the procedures included in the KNS 660 Pilot's Guide

SECTION 3 – EMERGENCY PROCEDURES

If sensor information is intermittent or lost, utilize remaining operational navigation equipment as required.

System failures or abnormalities will be indicated by the "MSG" amber light annunciator (on the instrument panel) and will be spelled out on the CDU CRT display when the MSG button is depressed. This message should be noted and appropriate action taken by referring to the KNS 660 Pilot's Guide.

SECTION 4 – NORMAL PROCEDURES

a) Operation

1) Normal operating procedures are outlined in the KING Pilot's Guide, P/N 006-8407-00, dated Jan. 18, 1988 or later, for the specific level of Operational Revision Status displayed on the CDU Self Test page after power on.

b) System Annunciators

The KNS 660 CDU is equipped with a master message (MSG) light which illuminates to warn the crew of any of a list of warnings and failures. Refer to the KNS 660 Pilot's Guide for warning explanations. In addition, a four-sections remote annunciator is installed on the pilot's instrument panel and incorporates the following:

1) MESSAGE – The amber MSG of the annunciator will illuminate as a repeater of the MSG light on the CDU described above.

2) WAYPOINT ALERT – The amber WPT of the annunciator will illuminate 90 seconds prior to each waypoint when operating in the OBS mode, when approaching the last waypoint in the flight plan, or when going direct to a waypoint not in the flight plan. When in the AUTO/LEG mode, the illumination is 15 seconds prior to the automatic course change turn.

3) DEAD RECKONING – The amber DR annunciator light is illuminated whenever the system is in dead-reckoning.

4) CROSS TRACK – The amber SX annunciator light is illuminated whenever a left or right Cross Track (parallel offset) is activated.

SECTION 2 – LIMITATIONS

a) Prior to flight, whenever navigation is predicated on the use of the KNS 660, the flight crew must identify by CDU readout (on the Self Test page displayed at power on) the level of Operational Revision Status (ORS) and verify the applicable Pilot's Guide is available for use (for ORS 06 the Bendix/King KNS 660 Pilot's Guide P/N006-8407-00 dated Jan.18, 1988 or later revision, must apply).

b) Check, by CDU readout, the date recommended for Data Base (D/BASE) updating. If the KNS 660 Data Base has expired, IFR navigation is prohibited unless the pilot verifies each selected waypoint and navaid for accuracy by reference to current approved data.

c) The KNS 660 is approved for VFR/IFR RNAV charted enroute, terminal area, and approach operation.

d) During RNAV operations additional navigation equipment required for the specific type of operation must be installed and operable.

e) The computed position must be checked for accuracy (reasonableness) prior to use as means of navigation and under the following conditions:

1) Prior to each compulsory reporting point during IFR operation when not under radar surveillance or control.
2) At or prior to arrival at each enroute waypoint during RNAV operation along approved RNAV routes.
3) Prior to requesting off-airway routing, and at hourly intervals thereafter during RNAV operation off approved RNAV routes.

f) Whenever the accuracy check reveals a KNS 660 error of greater than 2NM, the KNS 660 must be updated to satisfy RNAV ENROUTE requirements.

g) Navigation cannot be predicated on the use of VLF/OMEGA guidance while in terminal areas or during departures from or approaches to airports or into valleys; e.g. between peaks in mountainous terrain or below Minimum Enroute Altitude (MEA).

h) During periods of Dead Reckoning (DR), navigation shall not be predicated on the use of the KNS 660 as a means of RNAV operation.

i) Following a period of Dead Reckoning (DR), the aircraft position should be verified and updated, as required, by visually sighting ground reference points and/or by using other installed navigation equipment such as VOR or DME.

j) When operating outside the magnetic compass Variation Area (North of 70° North latitude or South of 60° South latitude) the pilot must manually insert magnetic variation.

k) The KNS 660 with only OMEGA/VLF sensor operable is approved for VFR operations, provided the system is receiving adequate usable signals. The GPS sensor is not approved for navigation as a stand-alone sensor.

l) The GPS sensor input is designed to enhance any other sensor(s) input resulting in the composite position output.

NOTE

For the Germany registered airplanes the GPS sensor is not yet approved for navigation and is to be held in a non-operational condition.

m) Navigation should not be predicated on the KNS 660 System when a NAV flag is visible. Following a period (5 minutes or more) of invalid operation (NAV flag visible), the KNS 660 System position must be verified and updated as required.

n) Navigation Data Base (D/BASE) limitations:

1) The D/BASE must be updated to the latest revision every 28 days. Updating shall be accomplished with Bendix/King update diskette or equivalent. Update diskettes will be received by mail to subscribers several days before the effective date of revision.

2) The D/BASE loading/updating shall be performed following the procedures included in the KNS 660 Pilot's Guide.

SECTION 3 – EMERGENCY PROCEDURES

If sensor information is intermittent or lost, utilize remaining operational navigation equipment as required.

System failures or abnormalities will be indicated by the "MSG" amber light annunciator (on the instrument panel) and will be spelled out on the CDU CRT display when the MSG button is depressed. This message should be noted and appropriate action taken by referring to the KNS 660 Pilot's Guide.

SECTION 4 – NORMAL PROCEDURES

a) Operation

1) Normal operating procedures are outlined in the KING Pilot's Guide, P/N 006-8407-00, dated Jan. 18, 1988 or later, for the specific level of Operational Revision Status displayed on the CDU Self Test page after power on.

b) System Annunciators

The KNS 660 CDU is equipped with a master message (MSG) light which illuminates to warn the crew of any of a list of warnings and failures. Refer to the KNS 660 Pilot's Guide for warning explanations. In addition, a four-sections remote annunciator is installed on the pilot's instrument panel and incorporates the following:

1) MESSAGE – The amber MSG of the annunciator will illuminate as a repeater of the MSG light on the CDU described above.

2) WAYPOINT ALERT – The amber WPT of the annunciator will illuminate 90 seconds prior to each waypoint when operating in the OBS mode, when approaching the last waypoint in the flight plan, or when going direct to a waypoint not in the flight plan. When in the AUTO/LEG mode, the illumination is 15 seconds prior to the automatic course change turn.

3) DEAD RECKONING – The amber DR annunciator light is illuminated whenever the system is in dead-reckoning.

4) CROSS TRACK – The amber SX annunciator light is illuminated whenever a left or right Cross Track (parallel offset) is activated.

c) Aircraft Interface

The following procedures supplement the operating instructions in the KNS 660 Pilot's Guide.

1) To select KNS 660 display to the EFIS system and to the Flight Director, select L-NAV on the EFIS DSP panel.

a. When L-NAV is selected on the EFIS DSP (FMS1 annunciated on pilot's EHSI) and a navigation leg or the pseudo-VORTAC mode has been selected on the KNS 660, the following will be displayed:

TO-FROM	FMS to-from indication
COURSE BAR	FMS cross track deviation
NAV FLAG	FMS NAV invalid
COURSE ARROW & COURSE DISPLAY	FMS desired track as read against the azimuth card
BEARING POINTER	FMS display of BEARING TO WPT
MILES DISPLAY	FMS NMi to next waypoint

NOTE

The KNS 660 provides automatic course pointer drive while using the AUTO/LEG mode only. When using the OBS mode, the pilot must enter the course manually on the CDU.

NOTE

In the OBS or AUTO/LEG modes, the BRG displayed on the CDU is always the bearing from the present position to the selected TO waypoint. Therefore, the selected leg bearing will be displayed only when the CDI is centered. In AUTO/LEG mode, the bearing of the selected leg will change in flight because the KNS 660 displays the Great Circle route between the selected waypoints.

2) Flight Director Operation

a. Once the navigation leg or the pseudo-VORTAC mode has been selected and FMS1 is displayed on EFIS, the flight director can be selected by depressing the NAV select switch on the Autopilot Panel.
b. The KNS 660 system will be supplying a "Roll Steering" signal to the Flight Director System for navigation to the waypoint.

3) Autopilot Operation

To select KNS 660 steering information to the autopilot select L-NAV on the EFIS DSP panel, verify a FMS1 display on EFIS, verify Autopilot Panel display of NAV. Engage autopilot.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 6 – WEIGHT AND BALANCE

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the BENDIX/KING KNS 660 Multisensor Area Navigation System is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-50	DEPENDENT POSITION DETERMINING					
	KNS 660 SYSTEM					
	- Computer KNC-667 with OMEGA/VLF Bendix/King 066-04011-0039	15.30	– 30.90	– 4.73	1	
	- Control Display Unit KCU-567 Bendix/King 066-04012-0032	3.88	37.70	1.46	1	
	or					
	- Control Display Unit KCU-568 Bendix/King 066-04013-0032	4.19	37.70	1.58	1	
	- OMEGA/VLF Antenna KA 679 Bendix/King 071-01290-0000	2.80	175.00	4.90	1	
	GPS SYSTEM					
	- Receiver KLN-670 Bendix/King 066-01124-0000	3.60	– 16.50	– 0.59	1	
	with either					
	- Antenna/Preamplifier KA 670 Bendix/King 071-01361-0000	2.50	155.10	3.88	1	
	or					
	- Antenna (Low profile) KA 671 Bendix/King 071-01525-0000	0.19	155.10	0.29	1	
	and					
	- Preamplifier KA 670 Bendix/King 071-01361-0010	1.70	135.00	2.30	1	
	RUBIDIUM FREQUENCY STANDARD					
	- Rubidium Frequency Std. KA-167 Bendix/King 071-01292-0001	4.94	– 10.88	– 0.54	1	

SECTION 7 – SYSTEM DESCRIPTION AND OPERATION

The KNS 660 Flight Management System basically has three components: the NAV Computer (KNC) and the Control Display Unit (CDU) and an OMEGA/VLF H-Field Antenna.
Additionally the system may include a GPS receiver (in the nose) and its own antenna (on the top of the fuselage) as well as an optional Rubidium Frequency Standard (in the nose).
The CDU (installed in the pedestal) has a full alpha/numeric keyboard for entering data and a sunlight readable CRT display.

The KNC receives navigation inputs from Primary VOR/ILS receiver and Primary DME transceiver. With its internal data bank, its own internal OMEGA/VLF sensor, the GPS sensor (if installed) and other aircraft navigation sources (speed and heading), it analyzes combined input, and computes the most accurate position possible.

The KNC can automatically tune the DME and VOR stations, based on the location and strength of their signals. However, this feature can be overriden and stations manually selected with the normal controls to the DME/VOR receivers. Whether the DME or VOR stations are automatically tuned or not, the KNC will process the signals and display the station identifiers, frequency, range and bearing on the CDU screen.

The Portable Data Loader (KDL) allows flight plan downloading and/or updating the internal data base when needed.
Navigation information from KNC is displayed on the CDU and can be displayed on the pilot's Collins EFIS-85B System's Navigation Display (ND) and Multifunction Display (MFD) if L-NAV is selected on the Display Select Panel (DSP).

The OMEGA/VLF H-Field Antenna is mounted on the belly of the aircraft. A remote annunciator is installed above the pilot's Primary Flight Display (PFD) to display messages derived from both the KNC and CDU outputs.
The Rubidium Frequency Standard, if installed, improves the OMEGA/VLF sensor performances (ability to navigate with two valid stations only).

The ADC-85 Air Data Computer supplies the KNS 660 with all required air data information.

Collins APS-65 Autopilot System will receive the roll steer output from the KNC. The Autopilot Computer (APC-65A) will use this signal to navigate any time "L-NAV" is selected on EFIS DSP for display on the pilot's ND.
In such condition the KNS 660 is coupled to the Primary VOR/ILS receiver and channels 1 and 3 of the Primary DME (channel 2 is tuned via the secondary VOR/ILS control unit). If "L-NAV" is not selected on EFIS DSP, the KNS 660 behaves like a stand-alone system (no more coupled with navigation instruments).

28VDC is supplied to the System by the RH 28Vdc Avionics Bus through the "LRN-PWR" 5A circuit breaker located on the Copilot CB Panel. The 400 Hz for reference is supplied via the 26Vac Primary Bus located inside the AC Control Unit (mounted in the nose) through the "LRN-1" 1A fuse.
Annunciator power is derived from "LRN-PWR" Circuit Breaker (Copilot CB Panel). Annunciator test comes from aircraft's System Test Selector Panel (ANN LTS position).
The GPS sensor (if installed) is powered by the RH 28Vdc Avionics Bus through a 3A circuit breaker, labelled "LRN-SENSOR", located on the Copilot CB Panel.
The Rubidium Frequency Standard, if installed, is powered by the RH 28Vdc Avionics Bus through a 3A circuit breaker, labelled "CDU", located on the Copilot CB Panel.
Further details are included in the KNS 660 Flight Management System Pilot's Guide.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 5 FOR THE GLOBAL WULFSBERG GNS-X MULTISENSOR AREA NAVIGATION SYSTEM

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when a Global Wulfsberg GNS-X Navigation Management System with internal LORAN-C sensor is installed coupled with the EFIS-85B System.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The GNS-X is a Multisensor Area Navigation System which integrates the use of multiple navigation system/sensors.
Pilot workload is minimized by central programming of the navigation systems and display of information through a central CRT Control Display Unit (CDU); it has the capability to interface with up to four external navigation sensors of any compatible type.

SECTION 2 – LIMITATIONS

A. General

Prior to flight, whenever navigation is predicated on the use of the GNS-X, the flight crew must identify by CDU readout (on the Initialization page) the computer program installed and verify the applicable Operator's Manual is available for use (for PROGRAM 03 the Global Wulfsberg Report 1280, Revision 3, dated Nov. 1, 1989 or later revision must apply).

B. Verify by CDU readout the Navigation Data Base (NDB) expiration date (see Operator's Manual, Section 5). If ND Bisex pired RNAV is prohibited unless the pilot verifies each selected waypoint and navaid for accuracy by referring to current approved data.

C. The GNS-X is approved for VFR/IFR RNAV charted enroute and terminal operation.

D. When using the Multi-Sensor Area Navigation System, additional equipment required for the specific type of operation must be installed and operable.

E. The Multi-Sensor system position must be checked for accuracy prior to use as a means of navigation and under the following conditions:

1. Prior to each compulsory reporting point during IFR operation when not under radar surveillance or control.
2. At or prior to arrival at each enroute waypoint during RNAV operation along approved RNAV routes.
3. Prior to requesting off-airway routing, and at hourly intervals thereafter during RNAV operation off approved RNAV routes.

F. The GNS-X Multi-Sensor Area Navigation System should be updated to satisfy RNAV enroute accuracy requirements when a crosscheck with other onboard approved navigation equipment reveals an error greather than 2 NMi.

G. Navigation cannot be predicated on the use of LORAN-C guidance alone while in terminal areas or during departures from or approaches to airports or into valleys; e.g., between peaks in mountainous terrain or below Minimum Enroute Altitude (MEA).

H. During periods of Dead Reckoning (DR), navigation shall not be predicated on the use of the GNS-X as a means of RNAV operation.

I. Following a period of Dead Reckoning (DR), the aircraft position should be verified by visually sighting ground reference points and/or by using other installed navigation equipment such as VOR or DME.

J. The GNS-X is not approved for approach operation.

K. When operating outside the magnetic compass Variation Area (North of 70° North latitude or South of 60° South latitude) the pilot must manually insert magnetic variation.

L. The GNS-X with only LORAN-C sensor operable is approved only for VFR operations, provided the system is receiving adequate usable signals. LORAN-C operations are not approved in Italian region.

M. Navigation Data Base (NDB) limitations:

1. The NDB must be updated to the latest revision every 28 days. Updating should be accomplished with Global Wulfsberg update disk or equivalent. Update disks will be received by mail (to subscribers) or found at authorized Global installation centers or update centers.
2. When latitude/longitude, transferred from NDB, is displayed on the GNS-X CDU, the pilot will assure that it is a reasonable position for the requested identifier.

SECTION 3 – EMERGENCY PROCEDURES

If sensor information is intermittent or lost, utilize remaining operational navigation equipment as required.

System failures or abnormalities will be indicated by the "MSG" amber light annunciator (on the instrument panel) and will be spelled out on the CDU CRT display when the "MSG" button is depressed and held. This message should be noted and appropriate action taken by referring to the Operator's Manual, Report No.1280, Section 2, "Messages".

SECTION 4 – NORMAL PROCEDURES

A. Operation

Normal operating procedures are outlined in Global Wulfsberg Systems Operator's Manual Report 1280, Revision3, dated Nov.1, 1989 or later appropriate revision.

B. System Annunciators

The GNS-X CDU is equipped with a master (MSG) message light, which illuminates to warn the crew of any of a list of warnings and failures. The pilot presses the flashing MSG key to read the particular warning on the CDU. Refer to the GNS-X Operator's Manual, Report 1280, Revision 3 for warning explanations. In addition, the following system annunciators are installed on the pilot's instrument panel.

1. (MSG / WPT / DR / SX)
   A remote annunciator is mounted in the pilot's instrument panel and annunciates the following:
   a. (MSG)
      The amber "MSG" of the annunciator will illuminate as a repeater of the MSG light on the CDU described above.
   b. (WPT)
      The amber "WPT" of the annunciator will illuminate approximately within 30 seconds prior to next leg when in "AUTO" leg change mode, and at the waypoint when in "MAN" mode.
   c. (DR)
      The amber "DR" annunciator light is illuminated whenever the GNS-X is in dead-reckoning.
   d. (SX)
      The amber "SX" annunciator light is illuminated whenever the GNS-X has been programmed by the pilot for course guidance with respect to a couse offset from but, parallel to, the leg shown on the CDU.

2. (NAV 1 AUTOTUNE)

   A remote annunciator/switch is installed on the copilot's panel, near the NAV control panels. This annunciator (white) illuminates, whenever L-NAV is selected on EFIS DSP and the GNS-X is autotuning NAV1 (Primary VOR/ILS and Primary DME). The pilot can inhibit and override the autotune feature by manually selecting a different NAV1 frequency or selecting EFIS DSP back to VOR/LOC display.

C. VORTAC Position Unit (VPU) Quality Factor (QF)

The QF numerical display on CDU CRT indicates the reliability of position data from VPU sensor. QF will range from 2 to 99 (with 2 being optimum and 99 as dead reckoning). If QF exceeds an enterable value (from 2 to 98) a message is displayed on the Sensor Message page.

D. LORAN-C Estimated Position Error (EPE)

The EPE numerical display on CDU CRT indicates the reliability of position data from LORAN-C sensor. EPE will range from 1.9 to 9.9 nautical miles. When EPE is greater than 2.9 NMi. a warning message (ACCURACY WARN) is generated.

E. Aircraft Interface

The following procedures supplement the operating instructions in the GNS-X Operator's Manual, Report 1280, Revision3, dated Nov.1, 1989. or later appropriate revision.

1. To select GNS-X display to the EFIS system and to the Flight Director, select L-NAV on the EFIS DSP panel.

   a. When "LRN-1" is displayed on EFIS and a navigation leg or the pseudo-VORTAC mode has been selected on the GNS-X, the following will be displayed:

TO-FROM	LRN to-from indication
COURSE BAR	LRN cross track deviation
NAV FLAG	LRN NAV invalid
COURSE ARROW & COURSE DISPLAY	LRN desired track as read against the azimuth card
BEARING POINTER	LRN display of BEARING TO WPT
MILES DISPLAY	LRN NMi. to next waypoint

NOTE

In the Manual or Auto modes, the BRG displayed on the CDU is always the bearing from the present position to the selected TO waypoint. Therefore, the selected leg bearing will be displayed only when the CDI is centered. The bearing of the selected leg will change in flight because the GNS-X always displays the Great Circle route between the selected waypoints.

2. Flight Director Operation
   a. Once the navigation leg or the pseudo-VORTAC mode has been selected and LRN-1 is displayed on EFIS, the Flight Director can be selected by depressing the "NAV" select switch on the Autopilot Panel.
   b. The GNS-X system will be supplying a "Roll Steering" signal to the Flight Director System for navigation to the waypoint.

3. Autopilot Operation

   To select GNS-X steering information to the autopilot select L-NAV on the EFIS DSP panel, verify a LRN-1 display on EFIS, verify Autopilot Panel display of NAV. Engage autopilot.

F. Computer Program Identification (PROG 03)
1. Turn System on.
2. When initialization page automatically appears, note the program version number on the bottom line.

G. RATE-AIDING Mode

1. Automatic true airspeed (TAS) and heading are used for Rate Aiding.
2. If auto TAS is not available, Rate-Aiding must be provided by a manual TAS entry. If automatic variation is not available the Rate-Aiding must be supported by manual variation entry.
3. In the event that either TAS or variation entry is required a message light will be displayed. The message light will remain "ON" until action noted is taken.

H. Accuracy Check

The GNS-X position information can be checked for accuracy (reasonableness by reference to known ground position or VOR, DME, Tacan, NDB, or radar fix). When accuracy checks reveal the GNS-X position to be in error by 2 NMi. or more, updating is required in order to meet the enroute RNAV criteria.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by the Section 5 of the Pilot's Operating Handbook are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

When the Global GNS-X Navigation Management System is installed the following items must added to the Equipment List at the Section 6 "Weight and Balance" of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-50	DEPENDENT POSITION DETERMINING					
	GNS-X SYSTEM					
	- Loran C Antenna Global 121-014379-01	2.00	215.00	4.30	1	
	- Nav Management Unit (W. LORAN C) Global 14141-0203-1164	8.7	– 16.5	– 1.43	1	
	- Control Display Unit Global 14347-0101-02	6.5	37.7	2.45	1	
	- Data Transfer Unit Global 43000-01-01-04	4.0	37.7	1.50	1	

SECTION 7 – DESCRIPTION AND OPERATION

The GNS-X Navigation Management System consists of four components. The NAV Management Unit (NMU), the Control Display Unit (CDU), the LORAN-C antenna and the Data Transfer Unit (DTU).

The NMU installed in the pedestal has a full alpha/numeric keyboard for entering data and a sunlight readable CRT display.

The NMU receives navigation inputs from Primary VOR/ILS receiver and Primary DME transceiver. With its own internal LORAN-C sensor, its internal data bank and other aircraft sensors (speed and heading), it analyzes combined inputs and computes the most accurate position possible.
Air data and heading information are provided by the ADC-85 Air Data Computer and the Primary Compass System respectively.
The APS-65 Autopilot System will receive roll steering outputs from the NMU. These signals are used by the autopilot computer anytime L-NAV is selected on EFIS DSP. In such condition the GNS-X is coupled to the Primary VOR/ILS receiver and to channels 1 and 3 of the Primary DME (channel 2 is tuned via the Secondary VOR/ILS control unit).
If L-NAV is not selected on EFIS DSP the GNS-X behaves like a stand-alone system.
When the "NAV1 AUTOTUNE" annunciator is depressed, the NMU will automatically tune the DME and VOR stations, based on their location and signal strength. However this feature can be overridden and stations manually selected with the normal controls (knobs) to the VOR/DME units.
Whether the DME/VOR stations are automatically tuned (annunciator on) or not, the NMU will process the signals and display the stations identifier, frequency, range and bearing on the CDU screen.
In addition the flight crew can manually tune COM, NAV, DME frequencies and XPONDER codes via the CDU (instead of using the control heads).
The Data Transfer unit (DTU) may be either installed on the airplane or housed in a portable case to allow flight plans downloading and/or NMU internal data base update.
Navigation information from NMU is always displayed on the CDU. Additionally it can be displayed on the pilot's EFIS-85B System's Navigation Display (ND) and Multifunction Display (MFD) if L-NAV is selected on the Display Select Panel (DSP).
Another remote "MSG/WPT/DR/SX" annunciator is installed above the pilot's Primary Flight Display (PFD) to display messages derived from both the NMU and CDU outputs.
The LORAN-C antenna is mounted on the belly of the aircraft.
28 VDC power is supplied to the system by the RH 28 VDC Avionics Bus through the "LRN-PWR" 5A circuit breaker (located on the copilot CB panel). The 400 Hz reference is supplied by the 26 VAC Primary Bus located inside the AC Control Unit (in the nose) through the "LRN-1" 1A fuse.
Annunciators power is derived from the "LRN PWR" circuit breaker (Copilot CB Panel). Annunciators test comes from aircraft's System Test Selector panel (ANN LTS position).
Further details are included in the GNS-X Navigation Management System Operator's Manual.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 6 FOR PORTABLE SUPPLEMENTARY OXYGEN CYLINDER SCOTT AVIATION PRODUCTS EXECUTIVE MARK I

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Scott Aviation Executive MARK I portable supplementary oxygen cylinder is installed. The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The portable oxygen cylinder provides a supplementary oxygen source for crew and passengers use, if requested, during flights at each cabin altitude when the cabin pressurization control system is operative or below 16500 feet cabin altitude in the event the cabin pressurization control system is inoperative.

SECTION 2 – LIMITATIONS

A. Use of supplementary oxygen is allowed only when the cabin is pressurizzed or the cabin altitude is below 16500 feet.

B. Oxygen bottle must be stowed during takeoff and landing.

C. No smoking allowed while oxygen is being used by anyone in the airplane.

PLACARDS

On the inner side of the cabinet door:

PORTABLE OXYGEN BOTTLE
USE ONLY WHEN CABIN IS PRESSURIZED
OR CABIN ALT. BELOW 16500 FT

OXYGEN BOTTLE MUST BE STOWED DURING TAKE-OFF AND LANDING

SECTION 3 – EMERGENCY PROCEDURES

No changes to the emergency procedures provided by the Section 3 of the Pilot's Operating Handbook arenecessary for this supplement.

SECTION 4 – NORMAL PROCEDURES

WARNING

Use only when cabin is pressurizzed or cabin altitude below 16500 feet.
Do not smoke in cabin when oxygen is in use.
Keep combustible oils, greases, dusts, lint, metal chips, or other contaminants away from oxygen equipment, because they may become the initial cause of spontaneous fire or explosion.
Oxygen bottle must be stowed during takeoff and landing.

PREFLIGHT

Check the pressure gauge on the cylinder for oxygen amount indication.

NOTE

Full cylinder registers 1800 psig. on pressure gauge.

IN-FLIGHT

A. Attach masks tube over outlet fittings of the cylinder.

CAUTION

When using only one mask, disconnect the plug-in fitting from the outlet not in use, to be sure oxygen does not flow from that outlet.

B. Open cylinder valve approximately 1/2 turn counterclockwise

NOTE

When cylinder valve is open, oxygen is constantly flowing into masks and will continue to flow until valve is closed or cylinder is empty.

C. Check the flow indicator in the mask line for oxygen flow.
When the red indicator is visible, oxygen is not available at the mask.

D. Don the mask and breathe normally.

E. To conserve the oxygen when not in use, turn off the oxygen supply by turning the cylinder valve clockwise until finger tight.

NOTE

When not in use the cylinder must be installed on its support brackets located inside the closet compartment, attached to the forward partition.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by the Section 5 of the Pilot's Operating Handbook are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the Portable Supplementary Oxygen Cylinder is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
35	**OXYGEN**					
35-30	PORTABLE					
	PORTABLE SUPPLEMENTARY CYLINDER SCOTT AVIATION EXECUTIVE MARK I					
	- Oxygen Unit Scott Aviation Products 900019-01	9.00	210.00	18.90	1	

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SECTION 7 – DESCRIPTION AND OPERATION

A portable supplementary oxygen cylinder is attached to the aft vanity closet partition.
The Scott Aviation Executive Mark I oxygen unit supplies constant flow oxygen to the masks up to 16500 feet cabin altitude.
The cylinder is charged to 1800 PSI and has a capacity of 11 cu.ft. (311 liters).
The oxygen unit is provided with two masks each having an oxygen flow indicator. The two masks are stowed in a bag attached to the cylinder.
The cylinder is fitted with a pressure gauge and a top-mounted finger operated ON-OFF valve/ pressure regulator.
The average duration in hours from a cylinder fully charged to 1800 psig is shown in the following table:

CABIN ALTITUDE (feet)	PERSONS	
	1	2
0	2.75	1.38
12500	3.03	1.52
16500	3.13	1.57

WARNING

The portable oxygen system can be used with cabin altitude not higher than 16500 feet.
Use at higher cabin altitudes causes hypoxia.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

Remove the oxygen bottle from the airplane and send to a suitable service center for refilling. Aviators Breathing Oxygen per MIL-0-27210 pressurized to 1800 psig. at 70 °F must be used for refilling.

WARNING

Do not attempt to refill the oxygen bottle on board.

OXYGEN SERVICING CHART

Ambient Temperature Degrees Fahrenheit	After Cooling Pressure Static	* Filling Pressure For 1800 PSI At 70°F
0	1500	1600
10	1550	1650
20	1590	1675
30	1640	1725
40	1660	1775
50	1710	1825
60	1750	1875
70	1800	1925
80	1850	1950
90	1900	2000
100	1950	2050
110	1985	2100
120	2030	2150
130	2080	2200

* This column assumes about a 25 degree rise in temperature due to the heat of compression, and it assumes that the cylinders are being filled at their maximum rate. on

PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 7 FOR THE WOODWARD TYPE II FIXED PHASE SYNCHROPHASER

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the WOODWARD TYPE II Synchrophaser System is installed. The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The WOODWARD TYPE II FIXED PHASE Synchrophaser System allows the synchronization of the propeller, operating continuously on the propeller pitch to maintain a pre-defined propeller-phase relationship: the result is the reduction of the noise level in the cabin.

SECTION 2 – LIMITATIONS

No changes to the limitations provided by the Section 2 of the Pilot's Operating Handbook are necessary for this supplement.

SECTION 3 – EMERGENCY PROCEDURES

ENGINE FAILURES

ENGINE SECURING

1. Power lever - IDLE
2. Condition lever - CUT OFF
3. Ignition switch - CHECK NORM
4. Fuel firewall shut-off valve - CLOSED
5. Fuel pump switch - OFF
6. SYNCPH switch - OFF
7. Generator - OFF
8. Bleed - OFF
9. Crossfeed - AS REQUIRED

SECTION 4 – NORMAL PROCEDURES

CLIMB

1. Climb power - SET
2. Airspeed - REFER to Section 5 of this Manual
3. Seat belts and no smoking signs - AS REQUIRED
4. SYNCPH switch - SYNCPH

NOTE

Whenever the syncrhophaser system is to be engaged at the maximum propeller RPM, the condition levers must be retarded to a position corresponding to about 1980 RPM in order to maintain 2000 RPM.

5. Pressurization - CHECK

BEFORE LANDING

1. Seat belts and no smoking signs - ON
2. SYNCPH switch - OFF
3. Condition levers - MAX RPM
4. Gear (below 175 KIAS) - DN; CHECK 3 GREEN
5. Flaps (below 170 KIAS) - MID
6. Autofeather (below 150 KIAS) - ARM, CHECK LIGHT
7. Landing lights (below 160 KIAS) - AS REQUIRED

8. Flaps on final (below 150 KIAS) - DN

CAUTION

When operating in icing conditions, the landing procedure must be performed with flaps MID and the approach speed must be 131 KIAS.

9. Autopilot/Steering - OFF
10. Cabin pressure barometric condition - CHECK

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by the Section 5 of the Pilot's Operating Handbook are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the WOODWARD TYPE II synchrophaser system is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
61	**PROPELLERS**					
61-20	CONTROLLING					
	SYNCHROPHASER SYSTEM WOODWARD TYPE II					
	- Control Box WOODWARD L213796	0.70	269.10	1.88	1	
	- Magnetic Pickup WOODWARD 213181	0.16 (ea.)	325.8	0.52	2	
	- Propeller Target WOODWARD 3360-078	0.11 (ea.)	325.8	0.35	2	

SECTION 7 – DESCRIPTION AND OPERATION

The WOODWARD TYPE II FIXED PHASE Synchrophaser System consists of a control box, magnetic pick-ups and rotating propeller targets to send an electrical control signal to propeller governors having electrical speed trim capability.

The system operates on electronic impulses generated by a rotating target passing each magnetic pick-up, and sensed by the control box.

The control box compares the LH and RH signals and then sends voltage signals to the magnetic coils in the propeller governors to maintain a fixed phase relationship between them: the faster propeller increases slightly the blades pitch to slow down the rotational speed while the slower propeller decreases slightly the blades pitch to increase the speed.

In operation, the system slightly increases both propellers speed setting and from that point adjusts speed up or down, as required, to maintain the pre-defined propeller phase relationship.

Before engaging the synchrophaser, it is necessary to match the propeller RPM within 10 RPM or less: this must be done by ear, since attempting to match the propeller levers or tachometers may not be sufficient.

Setting the SYNCPH switch, on the PROPELLERS panel, to SYNCPH position, will engage the system when the relative position of the blades has drifted to within ± 30 rotational degrees of the preset internal phase setting.
The time required by the two propellers to drift within the phasing range before the system senses and corrects the phase relationship electronically, could be as long as 30 seconds.

If the RPM difference between the two propellers should exceed the holding range of the synchrophaser system (approximately 25 RPM), the system will disable its outputs and both propeller RPM will return to the original manual setting.

To reset the system, the SYNCPH switch must be turned to OFF, the propeller RPM must be re-adjusted to within 10 RPM or less, then the switch must be turned to SYNCPH position. Yet the re-engagement may occur without resetting the switch, provided the phase error is small.

If the synchrophaser system is engaged during an in-flight engine shutdown or a propeller feathering, the system will quickly detect an out of range condition and disengage automatically.

Whenever an in-flight engine shutdown occurs, or during approach and landing the synchrophaser must be turned OFF.

The electrical power to the system is supplied by the right dual feed bus through the 3 Amp PROP SYNCPH circuit breaker, located on the right circuit breaker panel.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 8 FOR THE COCKPIT HEATER

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the BF Goodrich - Safeway Product Inc. electrical cockpit heater is installed. The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The electrical cockpit heater improves the flight compartment heating provided by the environmental control system.

SECTION 2 – LIMITATIONS

Switch OFF the cockpit heater before engine shutdown.

SECTION 3 – EMERGENCY PROCEDURES

PRESSURIZATION AND ENVIRONMENTAL SYSTEM MALFUNCTION

ENVIRONMENTAL AUTO CONTROL FAILURE (OR DUCT TEMP LIGHT ON)

1. Cockpit heater switch - OFF

If the DUCT TEMP light persits illuminated:

2. Auto/Man switch - MAN
3. Man heat/Cool switch - AS REQUIRED

SECTION 4 – NORMAL PROCEDURES

BEFORE TAXI

1. Bleed air switches - SET to L and R positions
2. Cockpit heater switch - SET to COCKPIT HEATER position (if desired)
3. Before Taxi Procedure - COMPLETE

TAKEOFF/CLIMB/CRUISE/DESCENT/LANDING

1. Cockpit heater switch - SET to COCKPIT HEATER position (if desired)

SHUTDOWN

1. Cockpit heater switch - OFF

CAUTION

The electrical cockpit heater must be switched off before engine shutdown.

2. Engine Shutdown Procedure - COMPLETE

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by the Section 5 of the Pilot's Operating Handbook are necessary for this supplement.

PIAGGIO AERO

SECTION 6 – WEIGHT AND BALANCE

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the electrical cockpit heater is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
21	**AIR CONDITIONING**					
21-40	HEATING					
	COCKPIT HEATER					
	- Heater BF Goodrich/Safeway Prod. Inc. P/N 6978	1.20	126.60	1.52	1	

SECTION 7 – DESCRIPTION AND OPERATION

The electrical cockpit heater, installed into the conditioned air duct to the crew outlet ports, is located below the right side of the cabin floor.
The 500 Watt heater provides an improved heating delivery to the pilot compartment any time it is desired by the crew during the operations with engines running.

The electrical heater operation is controlled through the COCKPIT HEATER/OFF switch located in the ENVIR subpanel on the right side of the instrument panel close to the cabin rate of climb/descent gauge.
The COCKPIT HEATER/OFF switch is connected in series with the BLEED AIR L/OFF switch, which controls the left engine bleed air valve: this valve must be open (switch to L position) to allow the heater operation. Moving to the OFF position the BLEED AIR L/OFF switch the heater will be de-energized.
Whenever a left engine shutdown occurs the heater will be de-energized after the Engine Securing procedure has been completed: the COCKPIT HEATER/OFF switch should be turned to OFF if previously engaged.

Two thermal switches, which are integral part of the heater, sense the hot air temperature and protect the system against overheating. A relay, contolled by the two thermal switches, interrupts the power supply to the heater in the event of excessive air temperature.

The electrical power to the heater is supplied by the left generator bus through a 25 Amp circuit breaker.

The electrical cockpit heater must be switched off before engine shutdown.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 9 FOR THE FREON AIRCONDITIONER SYSTEM

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the airplane is equipped with one of the following Freon Airconditioner Systems:

- KEITH PRODUCTS INC. system with R12 operating fluid
- KEITH PRODUCTS INC. system with R134A operating fluid
- PROGRES S.r.l. system.

The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The Freon Airconditioner System improves the flight compartment and cabin cooling provided by the Environmental Control System (ECS) during either ground or flight operations.

MAXIMUM WEIGHT

Due to the installation of the system compressor/condenser unit with related hardware and tubing the Maximum Weight in the Baggage Compartment specified at Section 1 of the Pilot's operating Handbook must be reduced of 50 LBS (23 Kg.).

NOTE

As other optional equipment can be installed in the baggage compartment in conjunction of the Airconditioner system compressor/ condenser unit, a further reduction of the Maximum Weight in the Baggage Compartment must be considered as applicable.

BAGGAGE SPACE & ENTRY DIMENSIONS

Due to the installation of the system compressor/condenser unit the total Baggage Compartment Volume specified at Section 1 of the Pilot's operating Handbook must be reduced of 12.36 cu.ft (0.35 cu.m.).

NOTE

As other optional equipment can be installed in the baggage compartment in conjunction of the Airconditioner system compressor/ condenser unit, a further reduction of the Baggage Compartment Volume must be considered as applicable.

SECTION 2 – LIMITATIONS

MAXIMUM OPERATING ALTITUDE

Freon Airconditioner System Maximum Operating Altitude	20,000 FT

WEIGHT LIMITS

Maximum Weight in Rear Baggage Compartment	350 LBS (159 Kg.)

NOTE

As other optional equipment can be installed in the baggage compartment in conjunction of the Airconditioner system compressor/ condenser unit, a further reduction of the Maximum Weight in the Baggage Compartment must be considered as applicable.

PLACARDS

In front of the rear baggage compartment door when no other optional equipments are installed:

MAX LOAD : 350 lb
159 kg

MAX SPEC. LOAD : 50 lb/ft^2
244 kg/m^2

SECTION 3 – EMERGENCY PROCEDURES

AIR START

Before attempting an air start:

1. Freon system main control switch - OFF

SMOKE IN COCKPIT

Add the following step before performing the procedure:

1. Freon system main control switch - OFF

PIAGGIO AERO

SECTION 4 – NORMAL PROCEDURES

NOTE

During ground operation with a Ground Power Unit (GPU) only (both generators OFF) keep AVIONICS master switch OFF during the Freon Airconditioner start phase.

PREFLIGHT CHECK

REAR FUSELAGE (RIGHT SIDE)

Add the following checks:

1. Freon system condenser air intake - FREE FROM OBSTRUCTIONS
2. Freon system condenser air outlet - FREE FROM OBSTRUCTIONS

BEFORE ENGINE STARTING

1. Freon system main control switch - OFF
2. Before Engine Starting procedure - COMPLETE

BEFORE TAXI

NOTE

When on ground, during hot day operation, it may be necessary to increase N_G up to 58% maximum in order to maintain the ITT within limits or temporarily to switch the bleed air OFF (in this case no outside air is circulating in the cabin).

1. Freon system main control switch - ON (if desired)
2. FAN CKPT and FAN CABIN switches - AS REQUIRED
3. Before Taxi Procedure - COMPLETE

TAKEOFF/CLIMB/CRUISE/DESCENT/LANDING

1. Freon system main control switch - ON (if desired)

NOTE

During flight, when the Freon Airconditioner is used the Environmental Control System should be ON in order to guarantee adequate pressurization and ventilation.

SHUTDOWN

1. Freon system main control switch - OFF
2. Engine Shutdown Procedure - COMPLETE

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by the Section 5 of the Pilot's Operating Handbook are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the appropriate data of the following equipment list when either one of the KEITH PRODUCTS INC. or the PROGRES S.r.l. Freon Airconditioner System is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
21	**AIR CONDITIONING**					
21-50	COOLING					
	FREON AIRCONDITIONER KEITH PRODUCTS INC. (R12 fluid operated)					
	- Compressor/Condenser Unit Keith JBS 5001-1	49.00 (1)	280.50 331.00	137.45 162.19	1	
	- Evaporator, forward Keith JBS 275-4	2.40	6.70	0.16	1	
	- Blower, forward Keith JBS 275-2	3.30	6.70	0.22	1	
	- Evaporator, rearward Keith JBS 2040-1	6.80 (2)	204.00 232.00	13.87 15.77	1	
	- Blower, rearward Keith JBS 13001-1	3.30 (2)	204.00 232.00	6.73 7.66	1	
	(1) Rearward installation. (2) Configurations without toilet installation at rear cabin					

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
21	**AIR CONDITIONING**					
21-50	COOLING					
	FREON AIRCONDITIONER KEITH PRODUCTS INC. (R134A fluid operated)					
	- Compressor/Condenser Unit Keith JBS 5004-1	49.00 (1)	280.50 331.00	137.45 162.19	1	
	- Evaporator, forward Keith JBS 275-6	2.40	6.70	0.16	1	
	- Blower, forward Keith JBS 275-2	3.30	6.70	0.22	1	
	- Evaporator, rearward Keith JBS 2040-7	6.80 (1)	204.00 232.00	13.87 15.77	1	
	- Blower, rearward Keith JBS 13001-1	3.30 (1)	204.00 232.00	6.73 7.66	1	
	(1) Rearward installation.					
	(2) Configurations without toilet installation at rear cabin					

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
21	**AIR CONDITIONING**					
21-50	COOLING					
	FREON AIRCONDITIONER PROGRES S.r.l.					
	- Compressor/Condenser Unit Progres 2087.0106	49.00	331.00	162.19	1	
	- Evaporator, forward Progres 2087.3002	2.40	6.70	0.16	1	
	- Blower, forward Progres 2087.3007	3.30	6.70	0.22	1	
	- Evaporator, rearward Progres 2087.3001	6.80 (1)	204.00 232.00	13.87 15.77	1	
	- Blower, rearward Progres 2087.3006	3.30 (1)	204.00 232.00	6.73 7.66	1	
	(1) Configurations without toilet installation at rear cabin					

SECTION 7 – DESCRIPTION AND OPERATION

In order to improve the cockpit and cabin air cooling, a Freon Airconditioner System can be installed in addition to the basic Environmental Control System.

The Freon Airconditioner System consists of a compressor/condenser/dryer/receiver unit located in the rear baggage compartment and two evaporators, one installed behind the pilot instrument panel and the other one in the rear side of the passenger cabin. Two blowers, one for the pilot compartment and one for the passenger cabin, provide the air supply at low or high speed.
Due to the possible installation of other optional equipment, the arrangement of the airconditioner system compressor/condenser unit in the baggage compartment can assume two different configurations: a foreward or a rearward location as necessary.
One cold air outlet is located on each rudder pedal cover for the pilot and copilot use and another one is located in the rear cabin compartment.
The AIR COND panel with the system controls is located on the right side of the instrument subpanel.
A 3-position (OFF/FAN/COOL) main switch controls the operation of the system. When moved from OFF to the FAN position the switch controls the operation of both the blowers only. When moved to the COOL position the switch allows the operation of the blowers and of the compressor.
The FAN CKPT and the FAN CABIN 2-position (HIGH/LOW) switches allow setting of the corresponding blower operating mode to HIGH speed or LOW speed when the main control switch is in either COOL or FAN position.

The Freon Airconditioner is not controlled by the basic ECS temperature control and can be switched to COOL or OFF at crew convenience.

Each time the main control switch is set to COOL the two blowers will be actuated while the compressor/condenser unit requires that a GPU or both generators are operating. In the event of generator failure the compressor/condenser unit automatically stops operating.

The compressor/condenser unit is powered from the right generator bus through a 130-ampere fuse.
The blowers are powered from the right single feed bus through the AIR COND-PWR 20-ampere circuit breaker. The power for the system control is supplied by from the right single feed bus through the AIR COND-CONT 3-ampere circuit breaker. Both the breakers are located on the copilot circuit breaker panel.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

CAUTION

During ground operation with a Ground Power Unit (GPU) only (both generators OFF) keep AVIONICS master switch OFF during the Freon Airconditioner start phase.

NOTE

During ground operation with GPU only (both generators OFF) the Freon Airconditioner use in conjunction with the hydraulic system, the windshield defog/deice system, the forward wing anti-ice system (all systems operating symultaneously) may overload the right channel of the DC distribution system and cause the R OVLD circuit breaker (pilot circuit breaker panel) to trip.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 10 FOR THE UNIVERSAL NAVIGATION UNS-1A AND UNS-1B FLIGHT MANAGEMENT SYSTEMS

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Universal Navigation UNS-1A Flight Management System (Software configuration 340) or UNS-1B Flight Management System (Software configuration 400) is installed on the P.180 airplane equipped with Collins EFIS-85B4 System, Collins ADS-85 Digital Air Data System and Collins APS-65 Autopilot System as well as other standard avionics equipment.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

Both the UNS-1A and the UNS-1B are multisensor area navigation systems basically consisting of a cockpit mounted Control Display Unit (CDU), and remote mounted Navigation Computer Unit (NCU) interfaced with the aircraft navigation sensors, EFIS and Autopilot.

The installation on the P.180 also includes a Universal Navigation UNS 764-1 GPS/OSS sensor (combined GPS-OMEGA/VLF sensor).

WARNING

As the operation of the Worldwide Omega Radionavigation System has been terminated on 30 September 1997 and due to the "week rollover" problem involving the GPS portion starting from the 21 August 1999, the combined GPS Omega/VLF Sensor (GPS/OSS 764-1 type Sensor) is to be either removed or disabled and held in a non-operational condition. Refer to Piaggio Service Letter No. 80-0052 for further information.

Differences between the UNS-1A and the UNS-1B are limited essentially to the NCU (and the associated functions/capabilities).

NOTE

The following sections, unless otherwise specified, apply to the Flight Management System (FMS) whichever is the option installed (UNS-1A or UNS-1B).

SECTION 2 – LIMITATIONS

a) Prior to flight, whenever navigation is predicated on the use of the UNS-1A or UNS-1B, the flight crew must identify by CDU readout (on the initialization page) the software version and verify the applicable Operator's Manual is available for use.

UNS-1A: for SCN 340 the Universal Navigation Operator's Manual Report No. 2409sv340 must apply.

UNS-1B: for SCN 400 the Universal Navigation Operator's Manual Report No. 2421sv400 must apply.

b) Check, by CDU readout, the Data Base expiration date. If the Data Base is expired, IFR navigation is prohibited unless the pilot verifies each waypoint and navaid to be used for accuracy by reference to current approved data.

c) The UNS-1A and UNS-1B are approved for VFR, IFR, RNAV enroute, terminal area and approach operation provided that additional navigation equipment required for the specific type of operation must be installed and operable.

d) The FMS computed position must be checked for accuracy (reasonableness) prior to use as means of navigation under the following conditions:

1) Prior to each compulsory reporting point during IFR operation when not under radar surveillance or control.
2) At or prior to each enroute waypoint during RNAV operation along approved RNAV routes.
3) Prior to requesting off-airway routing, and at hourly intervals thereafter during RNAV operation.

e) Whenever the accuracy check reveals a system error greater than 2 nm, the FMS position must be updated to satisfy RNAV ENROUTE requirements.

f) The Worldwide Omega Radionavigation System has been terminated on 30 September 1997. The Omega/VLF portion of the equipment is to be either disabled or removed after the above date.

g) During periods of Dead Reckoning, navigation shall not be predicated on the use of FMS as a means of RNAV operation.

h) Following a period of dead reckoning, the FMS position should be verified and updated as required, by visually sighting ground reference points and/or by using other installed navigation equipment such as VOR or DME.

i) When operating outside the magnetic compass Variation Area (North of 70° North latitude or South of 60° south latitude) the pilot must manually enter magnetic variation.

j) The FMS with only the GPS sensor is not approved for navigation. The use of GPS sensor is only allowed to enhance the accuracy of the other sensors resulting in the system Best Computed Position.

CAUTION

The presently deployed GPS satellite constellation does not meet the coverage, availability, and integrity requirements for civil aircraft navigation equipment. Users are cautioned that satellite availability and accuracy are subject to change.

WARNING

The GPS portion of the installed GPS/OSS 764-1 Sensor is affected by the "week rollover" problem starting from 21 August 1999 and is to be either removed or disabled. No "credit" whatsoever can be applied towards the GPS portion of the sensor after the above date.

k) Navigation should not be predicated on the use of the FMS when the associated information is flagged (FMS1 red flag on EFIS displays). Following a period (5 minutes or more) of invalid operation (FMS1 flag in view), the FMS position should be verified and updated as required.

l) Navigation Data Base (D/BASE) Limitations:

1) The D/BASE must be updated to the latest revision every 28 days. Standard data for updating is provided by Jeppesen (or equivalent manufacturer) on a 28 days cycle. Update diskettes will be received by mail to subscribers several days before the effective date of applicability.
2) The D/BASE loading/updating shall be performed following the procedures included in the Operator's Manual referenced above by means of the Portable Data Transfer Unit.

SECTION 3 – EMERGENCY PROCEDURES

If navigation information from the FMS is intermittent or lost, utilize the remaining operational navigation equipment as required (position the CRS selector on EFIS DSP to VOR/ LOC).

System failures or abnormalities are indicated by the "MSG" (message) amber light annunciator on the instrument panel (as well as on EFIS displays) and are spelled out on the CDU CRT display when the MSG key (on the CDU itself) is depressed. Each system message should be noted and appropriate action taken by referring to the applicable Operator's Manual.

SECTION 2 – LIMITATIONS

a) Prior to flight, whenever navigation is predicated on the use of the UNS-1A or UNS-1B, the flight crew must identify by CDU readout (on the initialization page) the software version and verify the applicable Operator's Manual is available for use.

UNS-1A: for SCN 340 the Universal Navigation Operator's Manual Report No. 2409sv340 must apply.

UNS-1B: for SCN 400 the Universal Navigation Operator's Manual Report No. 2421sv400 must apply.

b) Check, by CDU readout, the Data Base expiration date. If the Data Base is expired, IFR navigation is prohibited unless the pilot verifies each waypoint and navaid to be used for accuracy by reference to current approved data.

c) The UNS-1A and UNS-1B are approved for VFR, IFR, RNAV enroute, terminal area and approach operation provided that additional navigation equipment required for the specific type of operation must be installed and operable.

d) The FMS computed position must be checked for accuracy (reasonableness) prior to use as means of navigation under the following conditions:

1) Prior to each compulsory reporting point during IFR operation when not under radar surveillance or control.
2) At or prior to each enroute waypoint during RNAV operation along approved RNAV routes.
3) Prior to requesting off-airway routing, and at hourly intervals thereafter during RNAV operation.

e) Whenever the accuracy check reveals a system error greater than 2 nm, the FMS position must be updated to satisfy RNAV ENROUTE requirements.

f) The Worldwide Omega Radionavigation System has been terminated on 30 September 1997. The Omega/VLF portion of the equipment is to be either disabled or removed after the above date.

g) During periods of Dead Reckoning, navigation shall not be predicated on the use of FMS as a means of RNAV operation.

h) Following a period of dead reckoning, the FMS position should be verified and updated as required, by visually sighting ground reference points and/or by using other installed navigation equipment such as VOR or DME.

i) When operating outside the magnetic compass Variation Area (North of 70° North latitude or South of 60° south latitude) the pilot must manually enter magnetic variation.

j) The FMS with only the GPS sensor is not approved for navigation. The use of GPS sensor is only allowed to enhance the accuracy of the other sensors resulting in the system Best Computed Position.

CAUTION

The presently deployed GPS satellite constellation does not meet the coverage, availability, and integrity requirements for civil aircraft navigation equipment. Users are cautioned that satellite availability and accuracy are subject to change.

NOTE

For the Germany registered airplanes the GPS sensor is not yet approved for navigation and is to be held in a non-operational condition.

WARNING

The GPS portion of the installed GPS/OSS 764-1 Sensor is affected by the "week rollover" problem starting from 21 August 1999. and is to be either removed or disabled. No "credit" whatsoever can be applied towards the GPS portion of the sensor after the above date

k) Navigation should not be predicated on the use of the FMS when the associated information is flagged (FMS1 red flag on EFIS displays). Following a period (5 minutes or more) of invalid operation (FMS1 flag in view), the FMS position should be verified and updated as required.

l) Navigation Data Base (D/BASE) Limitations:

1) The D/BASE must be updated to the latest revision every 28 days. Standard data for updating is provided by Jeppesen (or equivalent manufacturer) on a 28 days cycle. Update diskettes will be received by mail to subscribers several days before the effective date of applicability.
2) The D/BASE loading/updating shall be performed following the procedures included in the Operator's Manual referenced above by means of the Portable Data Transfer Unit.

SECTION 3 – EMERGENCY PROCEDURES

If navigation information from the FMS is intermittent or lost, utilize the remaining operational navigation equipment as required (position the CRS selector on EFIS DSP to VOR/ LOC).

System failures or abnormalities are indicated by the "MSG" (message) amber light annunciator on the instrument panel (as well as on EFIS displays) and are spelled out on the CDU CRT display when the MSG key (on the CDU itself) is depressed. Each system message should be noted and appropriate action taken by referring to the applicable Operator's Manual.

SECTION 4 – NORMAL PROCEDURES

a) Operation

Normal operating procedures are outlined in the applicable Operator's Manual for the specific software version as per para. a) at Section 2 of this Supplement.

CAUTION

Vertical deviation information and Fuel Management function provided by the FMS are to be used as advisory only under the pilot's responsibility.

b) System annunciators

Both the UNS-1A and UNS-1B installation on the P.180 includes two remote annunciator assemblies housed on the pilot's side of the instrument panel (above the EFIS EADI display). The one on the left incorporates the MSG (top) and the WPT (bottom) amber light annunciators. The other incorporates the APPR (top), HDG (bottom left) and XTK (bottom right) amber light annunciators.
The meaning of each annunciator is described below:

MSG (message)

The MSG amber annunciator will illuminate and flash in conjunction with the MSG light on the CDU and MSG annunciator on EFIS displays indicating that a new message has become active on the CDU message page(s).

WPT (waypoint alert)

The WPT amber annunciator will illuminate in conjunction with the blinking waypoint alert symbol on EFIS displays, about two minutes prior to the point of a leg change on a navigation leg or about 15 seconds prior to an approach waypoint. This may vary according to ground speed and amount of course change. When the WPT light illuminates, depressing the MSG key on the CDU will display the appropriate message. The light will automatically extinguish when the leg change occurs.

APPR (FMS approach mode)

The APPR amber annunciator will illuminate in conjunction to the FMS approach annunciator on EFIS displays, whenever the approach mode has been activated on the FMS. When the APPR light is on, the autopilot/flight guidance outputs are referenced to the waypoints on the pilot defined approach. This annunciator will extinguish when the FMS approach mode is cancelled.

HDG (FMS heading mode)

The HDG amber annunciator will illuminate, in conjunction with the FMS heading annunciator on EFIS displays, whenever the heading mode navigation option is selected on FMS. When this light is on, the autopilot/flight guidance outputs are referenced to the heading selected by the pilot on the FMS rather than to the active FROM-TO leg. This annunciator will extinguish as the FMS heading mode is cancelled (either automatically or manually). For additional details see Section 7 of this Supplement.

XTK (selected crosstrack)

The XTK amber annunciator will illuminate when a course parallel to the current navigation leg is selected. The XTK light will extinguish when the parallel course offset is cancelled either manually or automatically at the next leg change.

c) Aircraft interface

The following procedure supplements the operating instructions in the Operator's Manual.

1) To select the FMS as active navigation source for EFIS and Autopilot/Flight Guidance system, position the CRS selector on EFIS DSP panel to LNAV.

When LNAV is selected on EFIS DSP (FMS1 annunciated) the information displayed on EFIS include the following:

LATERAL DEVIATION	FMS Crosstrack or Pseudo-LOC deviation. (Enroute: linear 7.5 nm full scale; Approach: angular)
TO-FROM	FMS to-from indication.
FMS1 annunciator/flag	FMS valid/invalid.
FMS1 autopilot annunciator	Autopilot coupled to FMS.
FHDG1 autopilot annunciator	Autopilot coupled FMS heading mode.
COURSE (arrow & display)	FMS desired track as read against the azimuth card.
BEARING POINTER	FMS bearing-to waypoint.
WAYPOINT	Waypoint identifier and location (respect to the aircraft position).
DISTANCE TO WAYPOINT	FMS distance to TO waypoint.
APPROACH MODE annunciator	FMS approach mode.
VERTICAL DEVIATION	FMS VNAV deviation (500 ft/dot).
WIND SPEED & DIRECTION	FMS computed wind data.
DEAD RECKONING annunciator	FMS in Dead Reckoning mode.
MESSAGE	FMS message.

2) Flight Director operation:

Once the navigation leg or the pseudo VORTAC mode has been selected and FMS1 is annunciated on EFIS, the Flight Director can be coupled by depressing the NAV key on the Autopilot Controller. FMS1 mode annunciation (green) is provided on EFIS top left.
Computed roll steering commands are provided by the FMS to the Autopilot Flight Guidance Computer (through the EFIS processors) to drive the pilot's (and copilot's) ADI command bars (V-bars) in accordance to the selected path.
If the approach mode is activated on the FMS and APR mode is selected on the Autopilot Controller, the V-bars are driven according to the lateral deviation signals generated by the FMS.
Vertical guidance during approach is not provided in the P.180 installation.

3) Autopilot operation

Once the navigation leg or the pseudo VORTAC mode has been selected and FMS1 is annunciated on EFIS, the Autopilot can be coupled by depressing the NAV and AP ENG keys on the Autopilot Controller. FMS1 mode (green) is annunciated on EFIS top left in addition to AP (and YD).
Computed roll steering commands are provided by the FMS to the Autopilot Flight Guidance Computer (through the EFIS processors) to drive the pilot's (and copilot's) ADI command bars(V-bars) and control servos in accordance to the selected path.
If the approach mode is activated on the FMS and APR mode is selected on the Autopilot Controller, the V-bars and control servos are driven according to the lateral deviation signals generated by the FMS.
Vertical guidance during approach is not provided in the P.180 installation.

SECTION 5 – PERFORMANCE

No changes to the basic performances provided by Section 5 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the UNIVERSAL UNS-1A or UNS-1B Flight Management System is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-50	DEPENDENT POSITION DETERMINING					
	UNS-1A and UNS-1B SYSTEMS					
	- UNS-1A Nav. Computer Universal Nav. Corp. 1180-21-21	7.80	– 16.50	– 1.29	1	
	- UNS-1B Nav. Computer Universal Nav. Corp. 1190-01-1111	7.80	– 16.50	– 1.29	1	
	- Nav. Computer Mount Universal Nav. Corp. 80009000	2.40	– 16.50	– 0.40	1	
	- Control Display Unit Universal Nav. Corp. 1016-1-11	7.60	37.70	2.87	1	
	GPS-OMEGA/VLF SENSOR for UNS-1A and UNS-1B					
	- GPS/OSS Sensor UNS 764-1 Universal Nav. Corp. 100-601200-103	7.90	– 29.80	– 2.35	1	
	- GPS/OSS Sensor Mount Universal Nav. Corp. 80009000	2.40	– 29.80	– 0.72	1	
	- GPS Antenna Universal Nav. Corp. 100-602061-000	1.10	158.50	1.74	1	
	- OMEGA/VLF Antenna Universal Nav. Corp. 473-189-000	5.80	175.00	10.15	1	

SECTION 7 – DESCRIPTION AND OPERATION

The FMS (either the UNS-1A or the UNS-1B) basically consists of a Navigation Computer Unit (NCU), a Control Display Unit (CDU) and a Portable Data Transfer Unit (DTU) and remote annunciators. Additionally the installation in the P.180 includes a GPS/OSS sensor and associated antennas.

NOTE

The installed GPS/OSS 764-1 sensor is no more operable due to "week rollover" problem affecting the GPS portion of the unit after the 21 August 1999 and termination of Omega Radionavigation System after 30 September 1997. The sensor is to be either disabled or removed. Refer to Piaggio S. L. No. 80-0052.

The Control Display Unit (CDU) is located in the cockpit pedestal and allows the control of the system and all the associated sensors.

The Navigation Computer Unit (NCU), located in the nose avionics bay, houses the systemscentralprocessingunit,thenavigationsensors'interface circuits, the instruments (EFIS) interface and the navigation data base.

In the P.180 installation the NCU receives navigation inputs from the Primary VOR/DME (Collins VIR-32/DME-42), the Primary Compass System (Collins MCS-65), the Digital Air Data System (Collins ADS-85), the combined GPS-OMEGA/VLF long range navigation sensor (Universal UNS 764-1 GPS/OSS) and accepts weather radar "joystick" waypoint definition/ input from EFIS system (Collins EFIS 85-B4 three-tube). Digital and/or analog outputs, as appropriate, are provided to EFIS, Primary VOR/DME (for tuning) , and to the MSG/WPT/ APPR/XTK/HDG remote annunciators located on the pilot side of the instrument panel (see Section 4 of this supplement).

NOTE

Navigation inputs from the combined GPS-Omega/VLF sensor are no more available following the sensor disablement.

The NCU processes (Kalman filtering) the position data received from all available selected sensors and determines the Best Computed Position (BCP). A sensor "watchdog" feature, also accomplished by NCU, consists of continuously monitoring the difference between each sensor's position assessment and the BCP. If this difference exceeds a preset value the erratic sensor is automatically deselected to avoid BCP contamination and a proper message is generated to warn the operator.
A strut switch input to the NCU causes all available sensors to be automatically selected as the airplane lifts off and determines their deselection with automatic position hold at touchdown. Manual selection/deselection of individual sensors is however allowed both on ground and airborne. The strut switch information is overridden as the true airspeed exceeds 150 Kts.

Based on the BCP, the FMS allows navigation along the pilot programmed flight path which can include Standard Instrument Departure procedures (SIDs), airways, in-flight maneuvers, holding procedures, Standard Terminal Approach Route procedures (STARs), approaches and runways. The BCP is then used to provide all secondary navigation functions such as course, bearing, desired track, distance, estimated time enroute (ETE), estimated time of arrival (ETA), wind, ground speed, etc..

Using its internal data base the NCU automatically scans all available DMEs by using only the DME-42 blind channel without any interference with the pilot's controlled DME channels. Information from the scanned DME stations are presented both on the CDU DME page and on EFIS (Extended Data). The computed rho-rho position is not used to update any sensor position but tracked separately and blended into the BCP. Bearing information from VOR is used if only one DME is available or during RNAV approaches. VOR tuning is also performed by the NCU (directly or via the CDU).

If the the CRS selector on the EFIS Display Select Panel is positioned to LNAV, all navigation information from the FMS is displayed on EFIS Electronic HSI (EHSI) and Multifunction Display (MFD). In such condition, deviation signals from the FMS are routed by EFIS processors to the Autopilot computer. If NAV mode is selected on the Autopilot Controller, this information is then used either to drive the ADIs "V-Bars" (Flight Director Mode, with A/P disengaged) or to generate servo commands for automatic aircraft control (Autopilot Engaged Mode). The deviation signals generated by the NCU for autopilot/flight director coupled operations are related to the steering limits versus altitude established by the pilot (see Pilot's Guide Sect.5). The NCU calculates the circular arc to turn on course and provide a wings level rollout with the aircraft heading directly towards the next waypoint.

The FMS heading mode allows the pilot to command the Autopilot/Flight Guidance Computer to fly a selected heading without the need of dropping the A/P NAV mode and selecting the A/P HDG mode. The selected heading can be entered either via the CDU keyboard or via the EFIS DSP heading bug and is displayed on both EFIS and CDU. This function can be used to fly a selected heading or to intercept the current navigation leg. In the latter case the FMS HDG mode is dropped as the leg is intercepted. During A/P coupled operation the activation of this mode causes FHDG1 autopilot mode annunciation (green) to replace FMS1 (green) on the EFIS EADI.

If the approach mode is activated on the CDU (only within about 50.0 nautical miles from the designated pilot defined end-of-approach point), the FMS, as installed on the P.180, provides lateral deviation signals and APPR annunciation for display on EFIS EADI and EHSI (2D approach), in addition to APPR remote annunciation. If the approach mode is selected on the Autopilot Controller too, autopilot/flight director coupled 2D approaches to any runway are allowed.

The FMS provides IFR guidance (2D only in the P.180) for VOR and VOR/DME approaches, in addition to conventional RNAV approaches, for any published non-precision IFR approach and allows FMS-enhanced VFR approaches as well.

The minimum operational sensors when flying a VOR/DME or RNAV approach are the VOR and DME from the referenced navaid. Other DME distances and information from other sensors (which meet the accuracy requirements) are used for position cross check and determine the approach mode to be canceled if a navigation accuracy degradation were detected.
For VOR approaches the VOR signals must be received from the referenced navaid as well as DME data from available facilities.

FMS enhanced VFR approaches can be flown using any combination of available sensors (that is the BCP) with no reference navaid required provided the BCP Q factor is lower than 28.
Air data and heading are required for every approach type.

The FMS also provides EFIS processors with vertical navigation (VNAV) information according pilot defined vertical flight path (waypoints altitude and target vertical speed) for display on EADI and EHSI during the enroute phase of flight (vertical deviation scale on the right side of the instruments with cross-shaped pointer).
In the P.180 installation VNAV information is advisory only and cannot be coupled to the autopilot/flight director.
Whenever the approach mode is activated, the FMS VNAV mode is cancelled and vertical deviation scale is removed from view.

Fuel Management is provided as a "stand-alone" function based on manual data entering (gross weight, fuel quantity, engines fuel flow, etc.) and display of information on the CDU only.

The NCU contains a non volatile memory (powered by two long-life batteries with life expectancy greater than four years) where is stored the internal data base containing worldwide or regional airports, navaids, enroute waypoints, terminal waypoints, NDBs and pilot defined data (waypoints, routes and flights plans, runways, SIDs, STARs and approaches). For UNS-1B only, the NCU memory can accomodate an Extended Data Base (including JEPPESEN SIDs, STARs, airways).

The Data Transfer Unit (portable) can be connected to the system for periodical data base update and/or flight plan up/downloading via the bulkhead connector on the right side of the pedestal (nearby the floor).

The combined GPS/OSS sensor, also installed in the nose bay includes two independent navigation sensors, namely OMEGA/VLF and GPS.

NOTE

Navigation inputs from the combined GPS-Omega/VLF sensor are no more available following the sensor disablement.

The OMEGA/VLF antenna is a H-Field type and is located on the belly of the airplane.
The GPS antenna is a low-profile type with a built-in pre-amplifier located on the top of the fuselage.

The NCU, the DTU (if plugged in) and the GPS/OSS sensor are powered by the +28VDC RH Avionics Bus via the LRN-PWR (5A), LRN-DTU (3A) and LRN-SENSOR (3A) circuit breakers respectively (all located on the COPILOT CB PANEL). Power to the CDU is provided by the NCU.
The 400 Hz for reference is supplied (through the 1A LRN fuse) by the 26VAC Primary Bus located inside the AC Control Unit which is mounted in the nose.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 11 FOR THE UNIVERSAL NAVIGATION UNS-1A MMMS FLIGHT MANAGEMENT SYSTEM

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Universal Navigation UNS-1A MMMS (Multi-Mission Management System, Software configuration no. 203) is installed on the P.180 airplane equipped with Collins EFIS-85B4 System (three-tube), Collins MCS-65 Compass System, Collins ADS-85 Digital Air Data System and Collins APS-65 Autopilot System.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and the Approved Airplane Flight Manual.

The UNS-1A MMMS is a multisensor area navigation system basically consisting of a cockpit mounted Control Display Unit (CDU), and remote mounted Navigation Computer Unit (NCU) interfaced with the aircraft navigation sensors (VOR/DME, Air Data, etc.), EFIS and Autopilot. The installation on the P.180 also includes a Universal Navigation UNS 764-1 GPS/OSS sensor (combined GPS-OMEGA/VLF sensor).

WARNING

As the operation of the Worldwide Omega Radionavigation System has been terminated on 30 September 1997 and due to the "week rollover" problem involving the GPS portion starting from the 21 August 1999, the combined GPS Omega/VLF Sensor (GPS/OSS 764-1 type Sensor) is to be either removed or disabled and held in a non-operational condition. Refer to Piaggio Service Letter No. 80-0052 for further information.

If additional sensors and/or LNAV systems are installed, refer to the applicable supplement.

SECTION 2 – LIMITATIONS

a) Prior to flight, whenever navigation is predicated on the use of the UNS-1A MMMS, the flight crew must identify by CDU readout (on the initialization page) the software version and verify the applicable Operator's Manual is available:

Universal Navigation Operator's Manual Report. No.2409sv203

b) Check, by CDU readout, the Data Base expiration date. If the Data Base is expired, IFR navigation is prohibited unless the pilot verifies each waypoint and navaid to be used for accuracy by reference to current approved data.

c) The UNS-1A MMMS is approved for VFR, IFR, RNAV enroute, terminal area and approach operation provided that additional navigation equipment required for the specific type of operation are installed and operable.

d) The FMS computed position must be checked for accuracy (reasonableness) prior to use as means of navigation under the following conditions:

1) Prior to each compulsory reporting point during IFR operation when not under radar surveillance or control.
2) At or prior to each enroute waypoint during RNAV operation along approved RNAV routes.
3) Prior to requesting off-airway routing, and at hourly intervals thereafter during RNAV operation.

e) Whenever the accuracy check reveals a system error greater than 2 nm, the FMS position must be updated to satisfy RNAV ENROUTE requirements.

f) The Worldwide Omega Radionavigation System has been terminated on 30 September 1997. The Omega/VLF portion of the equipment is to be either disabled or removed after the above date.

g) During periods of Dead Reckoning, navigation shall not be predicated on the use of FMS as a means of RNAV operation.

h) Following a period of dead reckoning, the FMS position should be verified and updated as required, by visually sighting ground reference points and/or by using other installed navigation equipment such as VOR or DME.

i) When operating outside the magnetic compass Variation Area (North of 70° North latitude or South of 60° south latitude) the pilot must manually enter magnetic variation.

j) The FMS with only the GPS sensor is not approved for navigation. The use of GPS sensor is only allowed to enhance the accuracy of the other sensors resulting in the system Best Computed Position.

CAUTION

The presently deployed GPS satellite constellation does not meet the coverage, availability, and integrity requirements for civil aircraft navigation equipment. Users are cautioned that satellite availability and accuracy are subject to change.

WARNING

The GPS portion of the installed GPS/OSS 764-1 Sensor is affected by the "week rollover" problem starting from 21 August 1999 and is to be either removed or disabled. No "credit" whatsoever can be applied towards the GPS portion of the sensor after the above date.

k) Navigation should not be predicated on the use of the FMS when the associated information is flagged (FMS1 red flag on EFIS displays). Following a period (5 minutes or more) of invalid operation (FMS1 flag in view), the FMS position should be verified and updated as required.

l) Navigation Data Base (D/BASE) Limitations:

1) The D/BASE must be updated to the latest revision every 28 days. Standard data for updating is provided by Jeppesen (or equivalent manufacturer) on a 28 days cycle. Update diskettes will be received by mail to subscribers several days before the effective date of applicability.

2) The D/BASE loading/updating shall be performed following the procedures included in the Operator's Manual referenced above by means of the Portable Data Transfer Unit.

SECTION 3 – EMERGENCY PROCEDURES

If navigation information from the FMS is intermittent or lost, utilize the remaining operational navigation equipment as required (select VOR/LOC on EFIS DSP for VOR/LOC navigation; if an alternate system is installed, refer to the applicable operating instructions to enable its operation).

System failures or abnormalities are indicated by the "MSG" (message) amber light annunciator on the instrument panel (as well as on EFIS displays) and are spelled out on the CDU CRT display when the MSG key (on the CDU itself) is depressed. Each system message should be noted and appropriate action taken by referring to the applicable Operator's Manual.

SECTION 2 – LIMITATIONS

a) Prior to flight, whenever navigation is predicated on the use of the UNS-1A MMMS, the flight crew must identify by CDU readout (on the initialization page) the software version and verify the applicable Operator's Manual is available:

Universal Navigation Operator's Manual Report. No.2409sv203

b) Check, by CDU readout, the Data Base expiration date. If the Data Base is expired, IFR navigation is prohibited unless the pilot verifies each waypoint and navaid to be used for accuracy by reference to current approved data.

c) The UNS-1A MMMS is approved for VFR, IFR, RNAV enroute, terminal area and approach operation provided that additional navigation equipment required for the specific type of operation are installed and operable.

d) The FMS computed position must be checked for accuracy (reasonableness) prior to use as means of navigation under the following conditions:

1) Prior to each compulsory reporting point during IFR operation when not under radar surveillance or control.
2) At or prior to each enroute waypoint during RNAV operation along approved RNAV routes.
3) Prior to requesting off-airway routing, and at hourly intervals thereafter during RNAV operation.

e) Whenever the accuracy check reveals a system error greater than 2 nm, the FMS position must be updated to satisfy RNAV ENROUTE requirements.

f) The Worldwide Omega Radionavigation System has been terminated on 30 September 1997. The Omega/VLF portion of the equipment is to be either disabled or removed after the above date.

g) During periods of Dead Reckoning, navigation shall not be predicated on the use of FMS as a means of RNAV operation.

h) Following a period of dead reckoning, the FMS position should be verified and updated as required, by visually sighting ground reference points and/or by using other installed navigation equipment such as VOR or DME.

i) When operating outside the magnetic compass Variation Area (North of 70° North latitude or South of 60° south latitude) the pilot must manually enter magnetic variation.

j) The FMS with only the GPS sensor is not approved for navigation. The use of GPS sensor is only allowed to enhance the accuracy of the other sensors resulting in the system Best Computed Position.

CAUTION

The presently deployed GPS satellite constellation does not meet the coverage, availability, and integrity requirements for civil aircraft navigation equipment. Users are cautioned that satellite availability and accuracy are subject to change.

NOTE

For the Germany registered airplanes the GPS sensor is not yet approved for navigation and is to be held in a non-operational condition.

WARNING

The GPS portion of the installed GPS/OSS 764-1 Sensor is affected by the "week rollover" problem starting from 21 August 1999 and is to be either removed or disabled. No "credit" whatsoever can be applied towards the GPS portion of the sensor after the above date.

k) Navigation should not be predicated on the use of the FMS when the associated information is flagged (FMS1 red flag on EFIS displays). Following a period (5 minutes or more) of invalid operation (FMS1 flag in view), the FMS position should be verified and updated as required.

l) Navigation Data Base (D/BASE) Limitations:

1) The D/BASE must be updated to the latest revision every 28 days. Standard data for updating is provided by Jeppesen (or equivalent manufacturer) on a 28 days cycle. Update diskettes will be received by mail to subscribers several days before the effective date of applicability.

2) The D/BASE loading/updating shall be performed following the procedures included in the Operator's Manual referenced above by means of the Portable Data Transfer Unit.

SECTION 3 – EMERGENCY PROCEDURES

If navigation information from the FMS is intermittent or lost, utilize the remaining operational navigation equipment as required (select VOR/LOC on EFIS DSP for VOR/LOC navigation; if an alternate system is installed, refer to the applicable operating instructions to enable its operation).

System failures or abnormalities are indicated by the "MSG" (message) amber light annunciator on the instrument panel (as well as on EFIS displays) and are spelled out on the CDU CRT display when the MSG key (on the CDU itself) is depressed. Each system message should be noted and appropriate action taken by referring to the applicable Operator's Manual.

SECTION 4 – NORMAL PROCEDURES

a) Operation

Normal operating procedures are outlined in the applicable Operator's Manual for the specific software version as per para. a) at Section 2 of this Supplement.

CAUTION

Vertical deviation information and Fuel Management function provided by the FMS are to be used as advisory only under the pilot's responsibility.

NOTE

UNS-1A MMMS SEARCH PATTERNS - ORBIT
While inbound to the orbit, the distance associated to the displayed waypoint is the lenght of the arc to be flown (to complete the pattern), regardless of the actual distance from the center waypoint (CWPT), whereas the bearing is always to the CWPT.

b) System annunciators

The UNS-1A MMMS installation on the P.180 includes two remote annunciator assemblies housed on the pilot's side of the instrument panel (above the EFIS EADI display). The one on the left incorporates the MSG (top) and the WPT (bottom) amber light annunciators. The other incorporates the APPR (top), HDG (bottom left) and XTK (bottom right) amber light annunciators.
The meaning of each annunciator is described below:

MSG (message)

The MSG amber annunciator will illuminate and flash in conjunction with the MSG light on the CDU and MSG annunciator on EFIS displays indicating that a new message has become active on the CDU message page(s).

WPT (waypoint alert)

The WPT amber annunciator will illuminate in conjunction with the blinking waypoint alert symbol on EFIS displays, about two minutes prior to the point of a leg change on a navigation leg or about 15 seconds prior to an approach waypoint. This may vary according to ground speed and amount of course change. When the WPT light illuminates, depressing the MSG key on the CDU will display the appropriate message. The light will automatically extinguish when the leg change occurs.

APPR (FMS approach mode)

The APPR amber annunciator will illuminate in conjunction to the FMS approach annunciator on EFIS displays, whenever the approach mode has been activated on the FMS. When the APPR light is on, the autopilot/flight guidance outputs are referenced to the waypoints on the pilot defined approach. This annunciator will extinguish when the FMS approach mode is cancelled.

HDG (FMS heading mode)

The HDG amber annunciator will illuminate, in conjunction with the FMS heading annunciator on EFIS displays, whenever the heading mode navigation option is selected on FMS. When this light is on, the autopilot/flight guidance outputs are referenced to the heading selected by the pilot on the FMS rather than to the active FROM-TO leg. This annunciator will extinguish as the FMS heading mode is cancelled (either automatically or manually).

XTK (selected crosstrack)

The XTK amber annunciator will illuminate when a course parallel to the current navigation leg is selected. The XTK light will extinguish when the parallel course offset is cancelled either manually or automatically at the next leg change.

c) Aircraft interface

The following procedure supplements the operating instructions in the Operator's Manual.

1) To select the UNS-1A MMMS (FMS) as active navigation source for EFIS and Autopilot/ Flight Guidance system, position the CRS selector on EFIS DSP panel to LNAV.

If an alternate LNAV system is installed, the "FMS/(alternate LNAV system)" illuminated pushbutton, provided on the pilot side of the instrument panel, must be set to FMS.

In the above conditions (FMS1 annunciated) the information displayed on EFIS include the following:

LATERAL DEVIATION	FMS Crosstrack or Pseudo-LOC deviation. ENROUTE: 7.5 nm full scale APPROACH: angular
TO-FROM	FMS to-from indication.
FMS1 annunciator/flag	FMS valid/invalid.
FMS1 autopilot annunciator	Autopilot coupled to FMS.
COURSE (arrow & display)	FMS desired track as read against the azimuth card.
BEARING POINTER	FMS bearing-to waypoint.
WAYPOINT	Waypoint identifier and location (respect to the aircraft position).
DISTANCE TO WAYPOINT	FMS distance to TO waypoint.
APPROACH MODE annunciator	FMS approach mode.
VERTICAL DEVIATION	FMS VNAV deviation (500 ft/dot).
WIND SPEED & DIRECTION	FMS computed wind data.
DEAD RECKONING annunciator	FMS in Dead Reckoning mode.
MESSAGE	FMS message.

If LNAV is not selected on EFIS DSP information from the FMS is still available as second course (2ND pushbutton on EFIS DSP) and/or bearing (BRG selector on EFIS DSP to WPT).

The "alternate LNAV" selection on the "FMS/(alternate LNAV system)" illuminated pushbutton (instrument panel, pilot) determines the FMS interface to be completely disabled (enabling the interface to the alternate LNAV system).

2) Flight Director operation:

Once the navigation leg or the pseudo VORTAC mode has been selected and FMS1 is annunciated on EFIS (FMS selected as active navigation source), the Flight Director can be coupled by depressing the NAV key on the Autopilot Controller. FMS1 mode annunciation (green) is provided on EFIS top left.
Computed roll steering commands are provided by the FMS to the Autopilot Flight Guidance Computer (through the EFIS processors) to drive the pilot's (and copilot's) ADI command bars (V-bars) in accordance to the selected path.
If the approach mode is activated on the FMS and APR mode is selected on the Autopilot Controller, the V-bars are driven according to the lateral deviation signals generated by the FMS.
Vertical guidance during approach is not provided in the P.180 installation.

3) Autopilot operation

Once the navigation leg or the pseudo VORTAC mode has been selected and FMS1 is annunciated on EFIS (FMS selected as active navigation source), the Autopilot can be coupled by depressing the NAV and AP ENG keys on the Autopilot Controller. FMS1 mode (green) is annunciated on EFIS top left in addition to AP (and YD).
Computed roll steering commands are provided by the FMS to the Autopilot Flight Guidance Computer (through the EFIS processors) to drive the pilot's (and copilot's) ADI command bars (V-bars) and control servos in accordance to the selected path.
If the approach mode is activated on the FMS and APR mode is selected on the Autopilot Controller, the V-bars and control servos are driven according to the lateral deviation signals generated by the FMS.
Vertical guidance during approach is not provided in the P.180 installation.

SECTION 5 – PERFORMANCE

No changes to the basic performances provided by Section 5 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

PIAGGIO AERO

SECTION 6 – WEIGHT AND BALANCE

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the UNIVERSAL UNS-1A MMMS Flight Management System is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-50	DEPENDENT POSITIONDETERMINING					
	UNS-1A MMMS SYSTEM					
	- UNS-1A MMMS Nav. Computer Universal Nav. Corp. 1180-30-21	7.80	– 16.50	– 1.29	1	
	- Nav. Computer Mount Universal Nav. Corp. 80009000	2.40	– 16.50	– 0.40	1	
	- Control Display Unit Universal Nav. Corp. 1016-1-11	7.60	37.70	2.87	1	
	GPS-OMEGA/VLF SENSOR for UNS-1A MMMS					
	- GPS/OSS Sensor UNS 764-1 Universal Nav. Corp. 100-601200-103	7.90	– 16.50	– 1.30		
	- GPS/OSS Sensor Mount Universal Nav. Corp. 80009000	2.40	– 16.50	– 0.40		
	- GPS Antenna Universal Nav. Corp. 100-602061-000	1.10	158.50	1.74	1	
	- OMEGA/VLF Antenna Universal Nav. Corp. 473-189-000	5.80	175.00	10.15	1	

SECTION 7 – DESCRIPTION AND OPERATION

The UNS-1A MMMS (FMS) basically consists of a Navigation Computer Unit (NCU), a Control Display Unit (CDU) and a Portable Data Transfer Unit (DTU) and remote annunciators. Additionally the installation in the P.180 includes a GPS/OSS sensor and associated antennas.

NOTE

The installed GPS/OSS 764-1 sensor is no more operable due to "week rollover" problem affecting the GPS portion of the unit after the 21 August 1999 and termination of Omega Radionavigation System after 30 September 1997. The sensor is to be either disabled or removed. Refer to Piaggio S. L. No. 80-0052.

The Control Display Unit (CDU) is located in the cockpit pedestal and allows the control of the system and all the associated sensors.

The Navigation Computer Unit (NCU), located in the nose avionics bay, houses the systemscentralprocessingunit,thenavigationsensors'interface circuits, the instruments (EFIS) interface and the navigation data base.

In the P.180 installation the NCU receives navigation inputs from the Primary VOR/DME (Collins VIR-32/DME-42), the Primary Compass System (Collins MCS-65), the Digital Air Data System (Collins ADS-85), the combined GPS-OMEGA/VLF long range navigation sensor (Universal UNS 764-1 GPS/OSS) and accepts weather radar "joystick" waypoint definition/ input from EFIS system (Collins EFIS 85-B4 three-tube). Digital and/or analog outputs, as appropriate, are provided to EFIS, Primary VOR/DME (for tuning) , and to the MSG/WPT/ APPR/XTK/HDG remote annunciators located on the pilot side of the instrument panel (see Section 4 of this supplement).

NOTE

Navigation inputs from the combined GPS-Omega/VLF sensor are no more available following the sensor disablement.

The NCU can also accept navigation information from other compatible sensors (if installed) also allowing (in some cases) remote tuning via the CDU.

The NCU processes (Kalman filtering) the position data received from all available selected sensors and determines the Best Computed Position (BCP). A sensor "watchdog" feature, also accomplished by NCU, consists of continuously monitoring the difference between each sensor's position assessment and the BCP. If this difference exceeds a preset value the erratic sensor is automatically deselected to avoid BCP contamination and a proper message is generated to warn the operator.
A strut switch input to the NCU causes all available sensors to be automatically selected as the airplane lifts off and determines their deselection with automatic position hold at touchdown. Manual selection/deselection of individual sensors is however allowed both on ground and airborne. The strut switch information is overridden as the true airspeed exceeds 150 Kts.

Based on the BCP, the FMS allows navigation along the pilot programmed flight path which can include pilot defined waypoints, Jeppesen waypoints, in-flight maneuvers, search patterns, approaches and runways.
The BCP is then used to provide all secondary navigation functions such as course, bearing, desired track, distance, estimated time enroute (ETE), estimated time of arrival (ETA), wind, ground speed, etc..

Using its internal data base the NCU automatically scans all available DMEs by using only the DME-42 blind channel without any interference with the pilot's controlled DME channels. Information from the scanned DME stations are presented both on the CDU DME page and on EFIS (Extended Data). The computed rho-rho position is not used to update any sensor position but tracked separately and blended into the BCP. Bearing information from VOR is used if only one DME is available or during RNAV approaches. VOR tuning is also performed by the NCU (directly or via the CDU).

The UNS-1A MMMS (FMS) can be selected as active navigation source for EFIS and Autopilot/ Flight Guidance system, by setting to LNAV the CRS selector on EFIS DSP panel. If an alternate LNAV system is installed, the "FMS/(alternate LNAV system)" illuminated pushbutton, provided on the pilot side of the instrument panel, must be set to FMS as well.

If FMS operation is selected as active navigation source for EFIS, all navigation information from the FMS is displayed on EFIS Electronic HSI (EHSI) and Multifunction Display (MFD). In such condition, deviation signals from the FMS are routed by EFIS processors to the Autopilot computer. If NAV mode is selected on the Autopilot Controller, this information is then used either to drive the ADIs "V-Bars" (Flight Director Mode, with A/P disengaged) or to generate servo commands for automatic aircraft control (Autopilot Engaged Mode).

The deviation signals generated by the NCU for autopilot/flight director coupled operations are related to the steering limits versus altitude established by the pilot (see Pilot's Guide Sect.5). The NCU calculates the circular arc to turn on course and provide a wings level rollout with the aircraft heading directly towards the next waypoint.

The FMS heading mode (indicated by the HDG remote annunciator) allows the pilot to command the Autopilot/Flight Guidance Computer to fly a selected heading to intercept a flight plan leg without the need of dropping the A/P NAV mode and selecting the A/P HDG mode. The selected heading is to be entered via the CDU keyboard. The FMS heading mode is dropped as the leg is intercepted.

If the approach mode is activated on the CDU (only within about 50.0 nautical miles from the designated pilot defined end-of-approach point), the FMS, as installed on the P.180, provides lateral deviation signals for display on EFIS EADI and EHSI (2D approach), in addition to APPR remote annunciation. If the approach mode is selected on the Autopilot Controller too, autopilot/flight director coupled 2D approaches to any runway are allowed.

The FMS provides IFR guidance (2D only in the P.180) for VOR and VOR/DME approaches, in addition to conventional RNAV approaches, for any published non-precision IFR approach and allows FMS-enhanced VFR approaches as well.

The minimum operational sensors when flying a VOR/DME or RNAV approach are the VOR and DME from the referenced navaid. Other DME distances and information from other sensors (which meet the accuracy requirements) are used for position cross check and determine the approach mode to be canceled if a navigation accuracy degradation were detected.
For VOR approaches the VOR signals must be received from the referenced navaid as well as DME data from available facilities.
FMS enhanced VFR approaches can be flown using any combination of available sensors (that is the BCP) with no reference navaid required provided the BCP Q factor is lower than 28.
Air data and heading are required for every approach type.

The FMS also provides EFIS processors with vertical navigation (VNAV) information according pilot defined vertical flight path (waypoints altitude and target vertical speed) for display on EADI and EHSI during the enroute phase of flight (vertical deviation scale on the right side of the instruments with cross-shaped pointer).
In the P.180 installation VNAV information is advisory only and cannot be coupled to the autopilot/flight director.
Whenever the approach mode is activated, the FMS VNAV mode is canceled and vertical deviation scale is removed from view.

Fuel Management is provided as a "stand-alone" function based on manual data entering (gross weight, fuel quantity, engines fuel flow, etc.) and display of information on the CDU only.

The NCU contains a non volatile memory (powered by two long-life batteries with life expectancy greater than four years) where is stored the internal data base containing worldwide or regional airports, navaids, enroute waypoints, NDBs and pilot defined data (waypoints, routes and flights plans, runways, and approaches).

The Data Transfer Unit (portable) can be connected to the system for periodical data base update and/or flight plan up/downloading via the bulkhead connector on the right side of the pedestal (nearby the floor).

The combined GPS/OSS sensor, also installed in the nose bay includes two independent navigation sensors, namely OMEGA/VLF and GPS.

NOTE

Navigation inputs from the combined GPS-Omega/VLF sensor are no more available following the sensor disablement.

The OMEGA/VLF antenna is a H-Field type and is located on the belly of the airplane.
The GPS antenna is a low-profile type with a built-in pre-amplifier located on the top of the fuselage.

The NCU, the DTU (if plugged in) and the GPS/OSS sensor are powered by the +28VDC RH Avionics Bus via the LRN-PWR (5A), LRN-DTU (3A) and LRN-SENSOR (3A) circuit breakers respectively (all located on the COPILOT CB PANEL). Power to the CDU is provided by the NCU.
The 400 Hz for reference is supplied (through the 1A LRN fuse) by the 26VAC Primary Bus located inside the AC Control Unit which is mounted in the nose.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 12 FOR THE CARGO (OPTION # 13) AND COMBI (OPTION # 14) CONFIGURATIONS

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the airplane is equipped for cargo operations.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and the Approved Airplane Flight Manual.

A CARGO Kit and a COMBI Kit are available for installation in the cabin compartment, after removal of passenger accomodations. Full cargo or combined cargo/passenger operations are possible when respectively the CARGO or the COMBI Kit is installed.

SECTION 2 – LIMITATIONS

SEATING LIMITS

CARGO CONFIGURATION

The maximum permissible number of seats, including flight crew is 2.

COMBI CONFIGURATION

The maximum permissible number of seats, including flight crew is 4.

FLIGHT CREW LIMITS

Minimum Crew: 1 pilot and 1 operator (or copilot).

NOTE

The operator (or copilot) should be familiarized with load restrain system and cargo related tasks: i.e. cargo security, cargo fire inspection and fire fighting procedures.

LOADING LIMITATIONS

MAXIMUM LOADS

1. Maximum Load for each net is 800 LBS. (363 Kg.).
2. Maximum Load for each set of four straps is 800 LBS. (363 Kg.).
3. Structural load must not exceed 800 LBS. (363 Kg.) for each Cargo Section.
   - Cargo Sections A, B and C for CARGO Configuration (Figure 9-33 on page 9-162).
   - Cargo Sections A and B for COMBI Configuration (Figure 9-35 on page 9-164).
4. Maximum Specific Load on each Cargo Section must not exceed 153 LBS/SQ.FT. (747 Kg./sq.m.)

LOAD MAXIMUM SIZES

Due to the entry door dimensions and in order to ensure the accessibility, the following load sizes must be considered:

1. Maximum Height 37.40 in. (950 mm)
2. Maximum Width 31.50 in. (800 mm)
3. Maximum Length for each Cargo Section:
   - CARGO Configuration Refer to Figure 9-28 on page 9-154.
   - COMBI Configuration Refer to Figure 9-32 on page 9-158.
4. The Maximum Forward Limit for load edge in the COMBI Configuration is at F.S. 136.6 in. (3469 mm) (Figure 9-32 on page 9-158).

   The Maximum Forward Limit for load edge in the CARGO Configuration is at F.S. 95.6 in. (2428 mm).
5. Maximum Height of each bin or container is a function of its overall weight and must be limited in accordance with the following diagram (Figure 9-27) in order to avoid overload on the attachment structure.

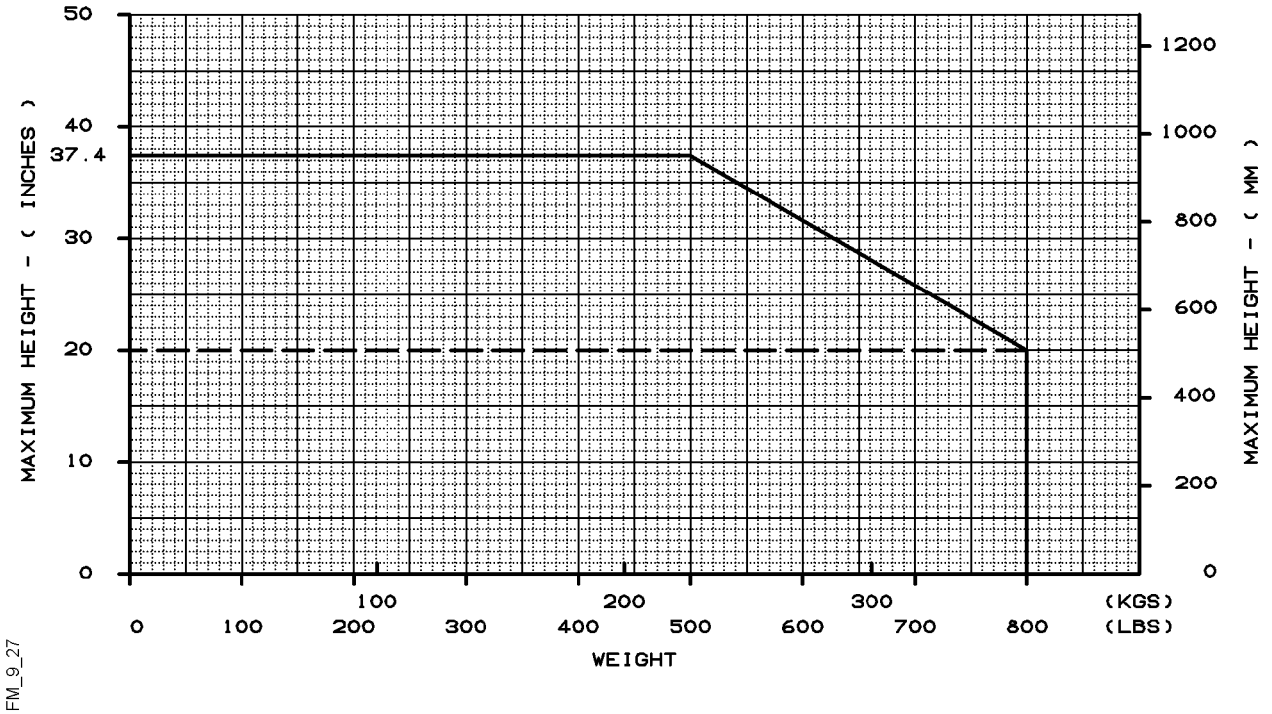

Figure 9-27. CONTAINER HEIGHT vs. WEIGHT.

LOAD RESTRAINT

WARNING

All loads must be stowed into approved bins or containers.
Loosened parcels restrained with nets are not allowed.
Do not superimpose bins or containers.

1. Each approved close bin or container will be restrained with a set of 4 straps (Figure 9-28 on page 9-154).
2. Each approved top-open bin or container will be restrained with a net and a set of 4 straps (Figure 9-31 on page 9-157). In this event, for a safe tie-down, the minimum size of each contained parcel will be not less than 10x10x10 in.

CAUTION

When the airplane is configured in either CARGO or COMBI configuration the floor loading panels not utilized for cargo must be arranged in a stack and positively secured to the floor rails with a set of 4 straps.

PLACARDS

On the right aft partition:

MAXIMUM STRUCTURAL LOAD
FOR EACH CARGO SECTION
800 LBS (363 KG)

MAXIMUM CONCENTRATED CARGO
LOAD 153 LBS/SQ.FT. (747 KG/M^2)

MAX CARGO HEIGHT: 37.4 IN (950 MM)
MAX CARGO WIDTH : 31.5 IN (800 MM)

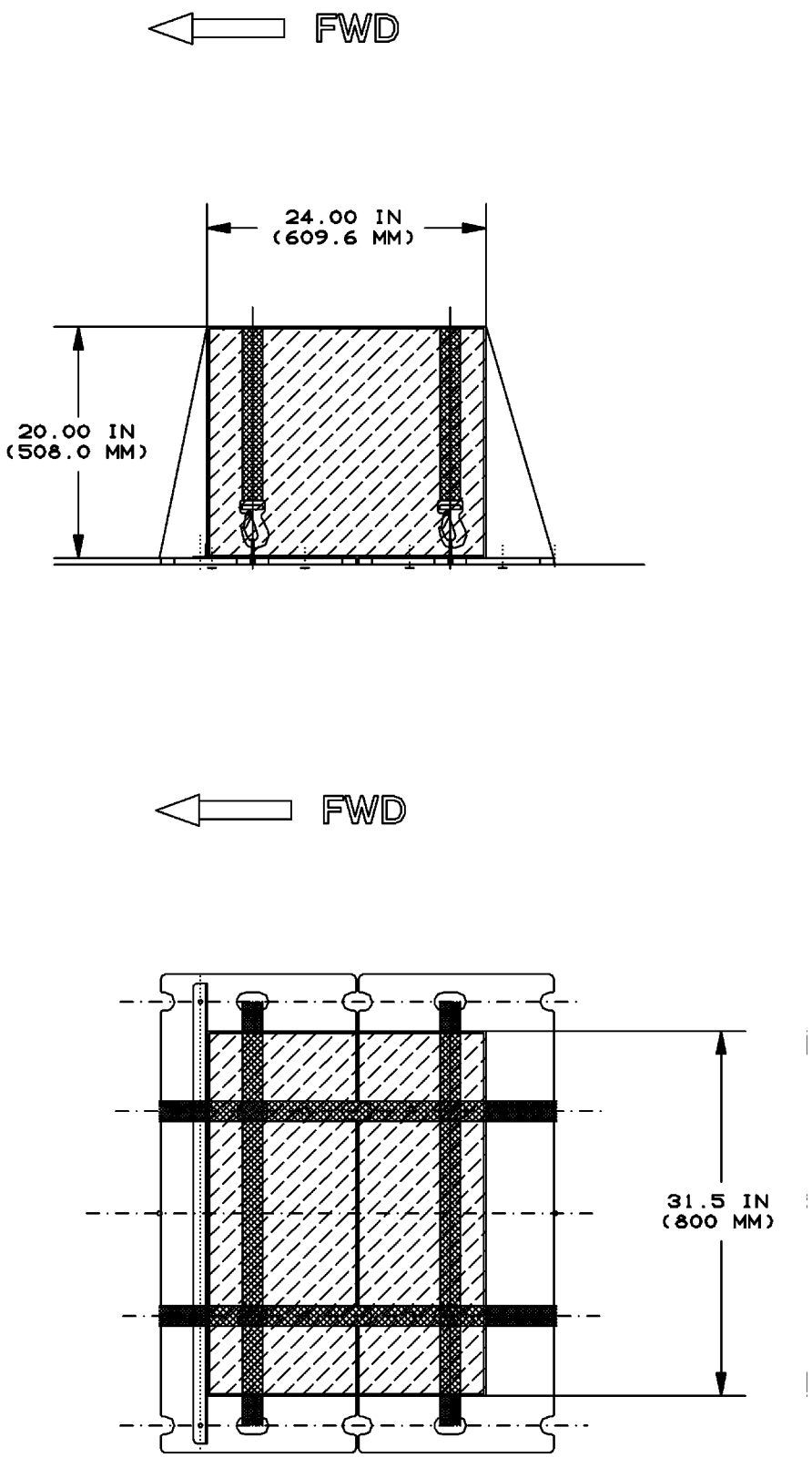

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Figure 9-28. LOAD RESTRAINT - MAXIMUM LENGHT AND WIDTH

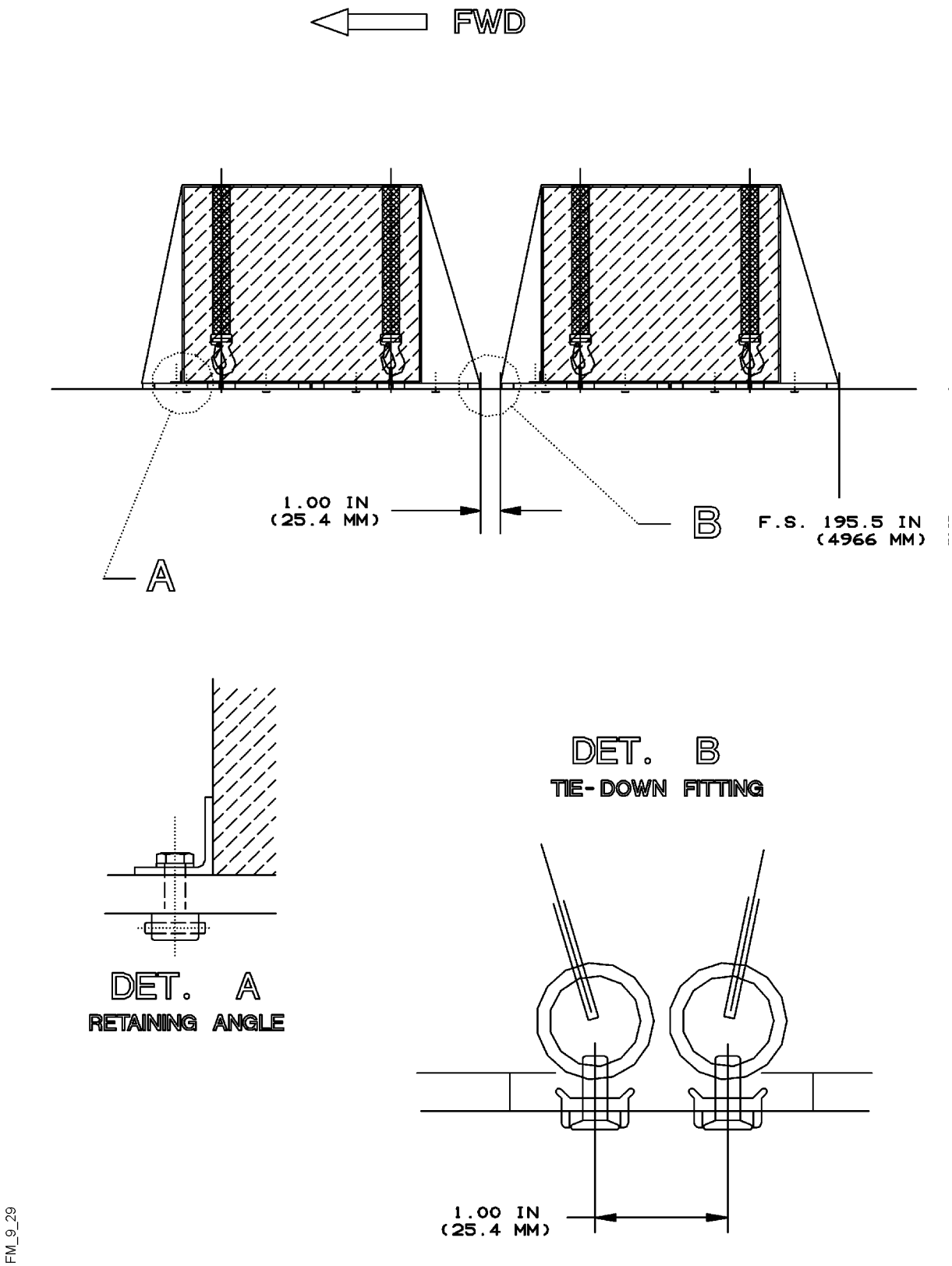

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Figure 9-29. LOAD RESTRAINT - FITTINGS AND RETAINING ANGLE

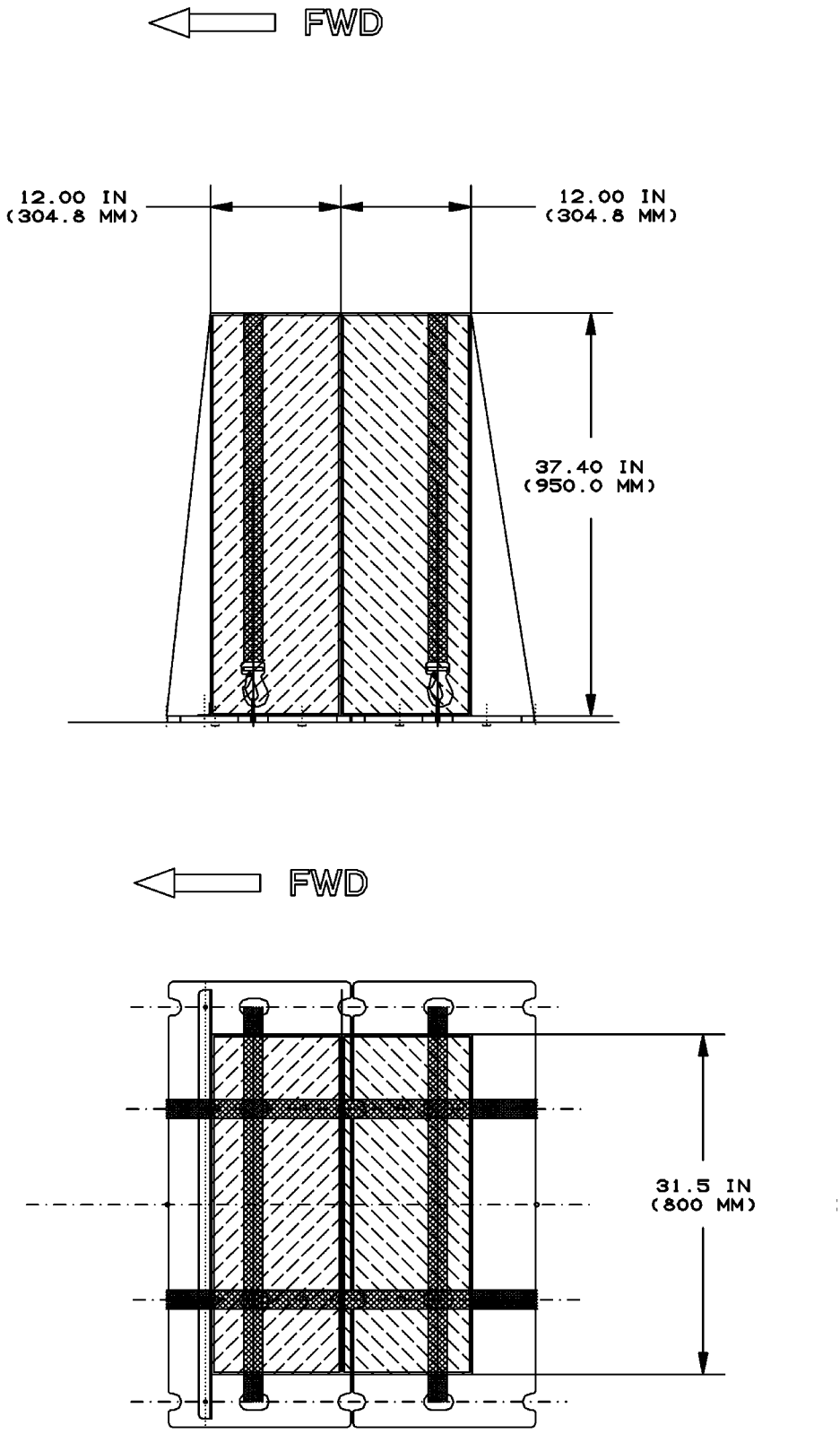

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Figure 9-30. LOAD RESTRAINT - MAXIMUM HEIGHT

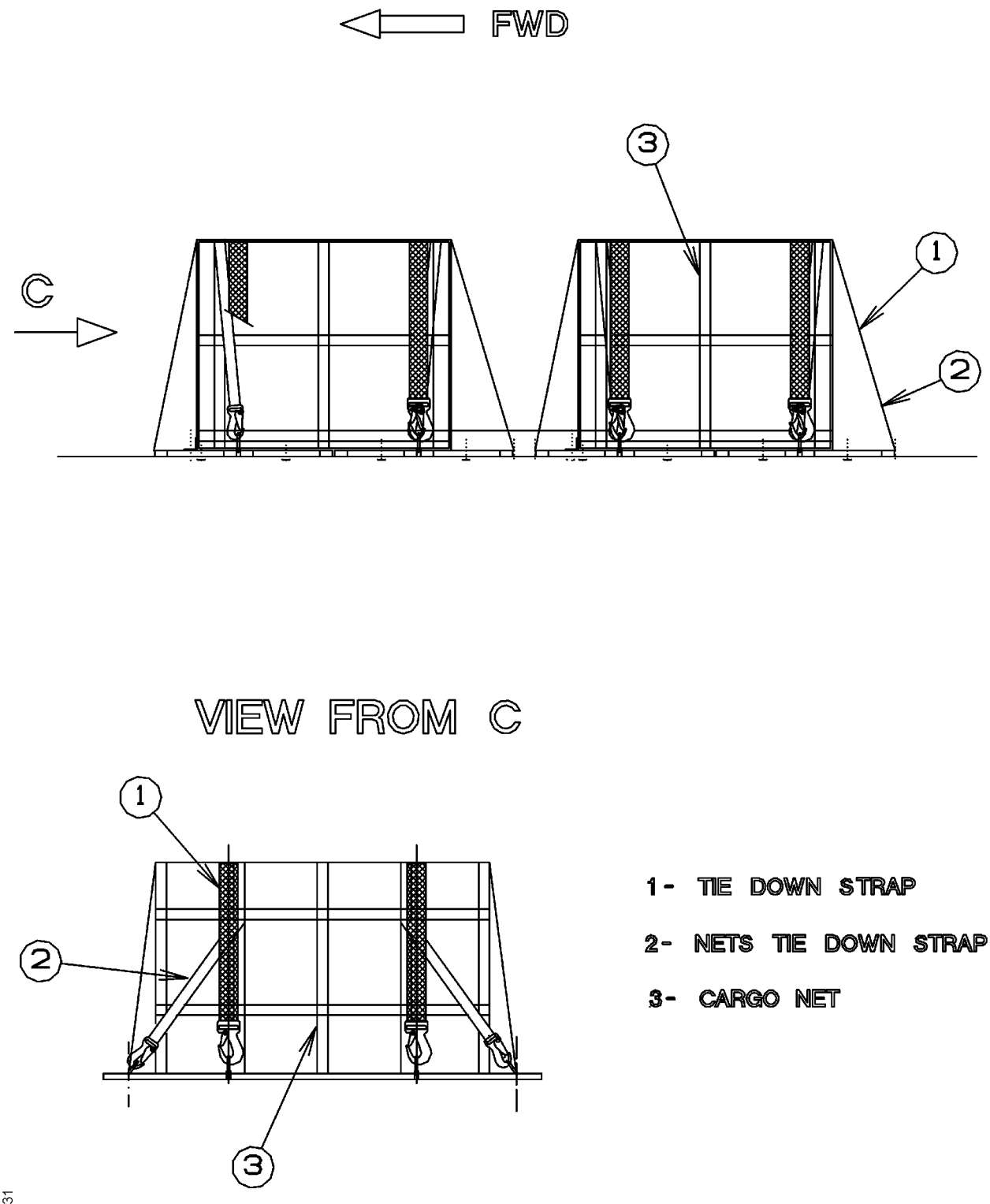
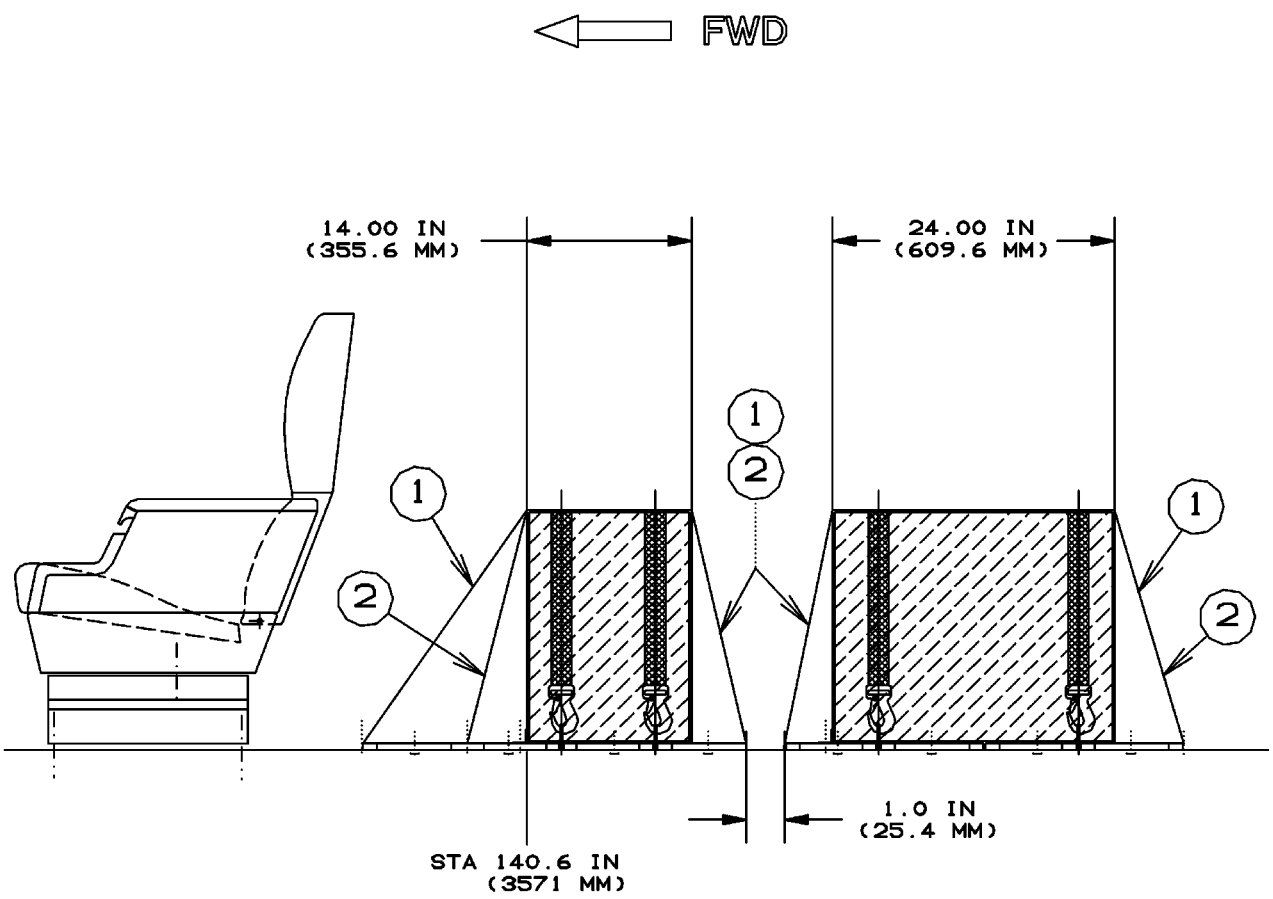


Figure 9-31. LOAD RESTRAINT - NETS AND STRAPS



1- TIE DOWN STRAP

2- NETS TIE DOWN STRAP

3- CARGO NET

FM_9_32

Figure 9-32. LOAD RESTRAINT - COMBI LOAD ARRANGEMENT

SECTION 3 – EMERGENCY PROCEDURES

SMOKE OR FIRE IN CARGO COMPARTMENT

1. Pilot - DON MASK AND GOGGLES
2. Copilot/Operator - DON Protective Breathing Equipment

NOTE

Refer to the "Protective Breathing Equipment" Supplement for the use and limitations of the Emergency Escape Hood EROS P/N 15-40F.

3. Passenger oxygen (COMBI Configuration) - MANUAL MASK RELEASE
4. Pilot oxygen mask microphone - OXY MIC
5. Bleed air switches - OFF
6. Cabin Pressurization - DUMP
7. EMERGENCY DESCENT Procedure - PERFORME

After Portable Breathing Equipment donning and during the emergency descent the copilot or operator must perform the following:

8. Flashlight (at night) - LOCATE/USE
9. Portable fire extinguisher - LOCATE/USE

After fire extinguished and smoke evacuation:

10. Bleed air switches - L & R
11. Passengers oxygen (COMBI Configuration) - NORMAL (if cabin altitude below 13000 ft)
12. Land as soon as pratical CABIN

SECTION 4 – NORMAL PROCEDURES

PREFLIGHT CHECK

CABIN

A load check has to be performed to ensure that:

- all tie-down fittings are inserted and secured in the seat rails
- all hooks, at the end of all straps, are safely engaged in the tie-down fittings rings
- all strap-buckles are tight.
- all floor loading panels not utilized for loads are arranged in a stack and safely secured to the floor rails with a set of 4 straps.

A check has to be performed to ensure that the bins or the containers in each cargo section, are located against the retaining angle, previously installed in forward position of each cargo section (see detail A of Figure 9-29 on page 9-155).

Figure 9-29 on page 9-155 shows a typical arrangement of two cargo sections loading for the CARGO configuration.

Figure 9-28 on page 9-154 shows a typical arrangement, location, maximum dimension and restraining of the maximum cargo weight (800 lbs) on each cargo section.

Figure 9-30 on page 9-156 shows a typical arrangement, location and restraining of maximum cargo volume on each cargo section.

Figure 9-32 on page 9-158 shows a typical arrangement of the two cargo section loading for the COMBI configuration, with the longitudinal limitations of the forward cargo section.

SECTION 5 – PERFORMANCE

No changes to the basic performances provided by Section 5 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the airplane is arranged in either the CARGO or COMBI Configuration.

CARGO AND COMBI LOADING

The method of loading cargo, its placement in the airplane and the method of restraint should each be determined before starting the actual loading.

For loads that are evenly distributed in a given section, the CARGO/COMBI Loading Charts for the maximum forward loading location are supplied. For any other useful load rearward location it will be necessary to determine its own C.G. and its location in the airplane. Determine the C.G. arm (Fuselage Station) by measuring in inches, from a known location in the cabin to the C.G. of the load. Determine the "moment" for the load by multiplying the weight by the C.G. arm (Fuselage Station). This resultant should be divided by 100 to be compatible with other loading data.

Weight and C.G. position must be controlled during cargo operation to avoid exceeding the weight and C.G. limits as per Figure 6-3 at Section 6 of the basic P.O.H..

Baggage compartment can be loaded, if required, to maintain the airplane C.G. within limits.

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OCCUPANTS AND CARGO LOAD

CARGO CABIN CONFIGURATION (OPTION # 13)

OCCUPANTS

WEIGHT LBS	CREW SEATS ARM 49.20 IN
	MOMENT (LBS · IN/100)
100	49.20
110	54.12
120	59.04
130	63.96
140	68.88
150	73.80
160	78.72
170	83.64
180	88.56
190	93.48
200	98.40
210	103.32
220	108.24

CARGO

WEIGHT LBS	SECTION A CENTROID 177.70 IN	SECTION B CENTROID 142.70 IN	SECTION C CENTROID 107.70 IN
	MOMENT (LBS · IN/100)		
20	35.54	28.54	21.54
40	71.08	57.08	43.08
60	106.62	85.62	64.62
80	142.16	114.16	86.16
100	177.70	142.70	107.70
200	355.40	285.40	215.40
300	533.10	428.10	323.10
400	710.80	570.80	430.80
500	888.50	713.50	538.50
600	1066.20	856.20	646.20
700	1243.90	998.90	753.90
800	1421.60	1141.60	861.60

NOTE

The assumed centroid, for each cargo section, is defined by the maximum cargo load length (see Figure 9-28 on page 9-154) assuming that the bins or containers are located against the retaining angle installed in forward position of each cargo section.

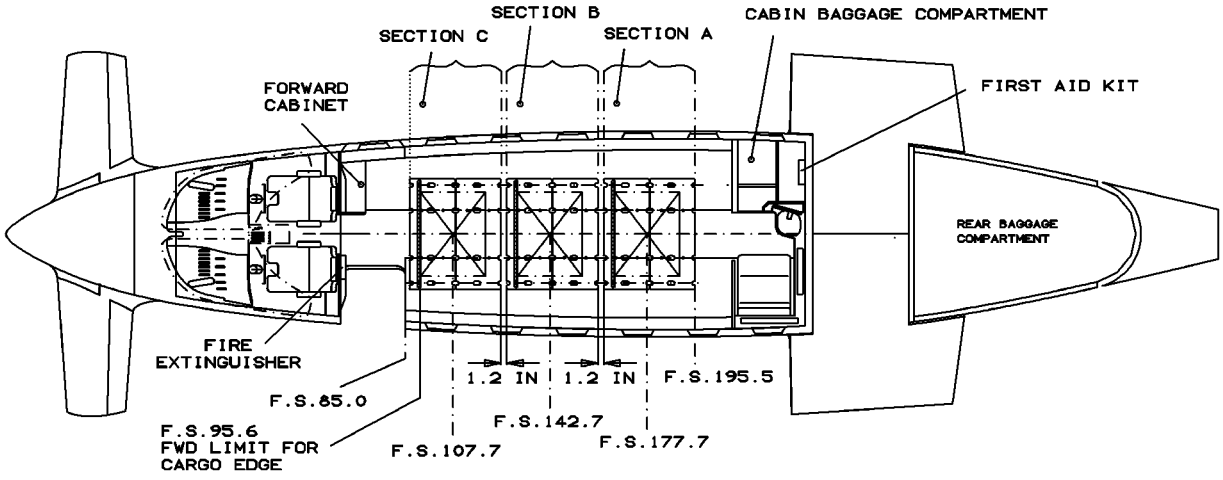

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Figure 9-33. LOADING CHART - OCCUPANTS AND CARGO

BAGGAGE LOAD

CARGO CABIN CONFIGURATION (OPTION # 13)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

FM_9_34

Figure 9-34. LOADING CHART - BAGGAGE

PIAGGIO AERO

OCCUPANTS AND CARGO LOAD
COMBI CABIN CONFIGURATION (OPTION # 14)

OCCUPANTS

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEATS (*) 1 & 2 ARM 107.70 IN	SEATS (**) 1 & 2 ARM 107.84 IN
	MOMENT (LBS · IN/100)		
100	49.20	107.70	107.84
110	54.12	118.47	118.62
120	59.04	129.24	129.41
130	63.96	140.01	140.19
140	68.88	150.78	150.98
150	73.80	161.55	161.76
160	78.72	172.32	172.54
170	83.64	183.09	183.33
180	88.56	193.86	194.11
190	93.48	204.63	204.90
200	98.40	215.40	215.68
210	103.32	226.17	226.46
220	108.24	236.94	237.25

CARGO

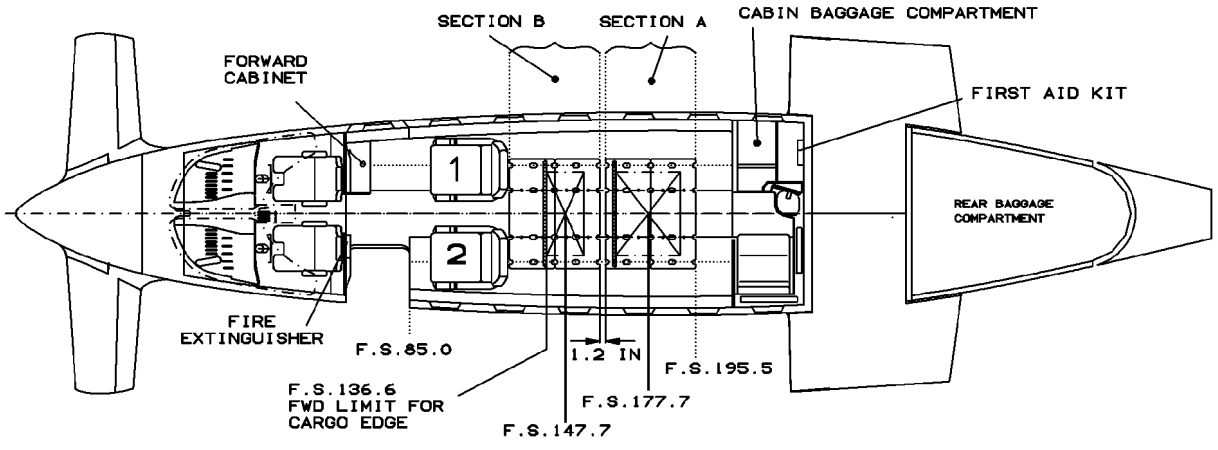
WEIGHT LBS	SECTION A CENTROID 177.70 IN	SECTION B CENTROID 147.70 IN
	MOM. (LBS · IN/100)	
20	35.54	29.54
40	71.08	59.08
60	106.62	88.62
80	142.16	118.16
100	177.70	147.70
200	355.40	295.40
300	533.10	443.10
400	710.80	590.80
500	888.50	738.50
600	1066.20	886.20
700	1243.90	1033.90
800	1421.60	1181.60

(*) Use these data for C.G. calculation with ERDA high comfort seats installed as per Equipment List.

(*) Use these data for C.G. calculation with ERDA or GEVEN light seats installed as per Equipment List.

NOTE

The assumed centroid, for each cargo section, is defined by the maximum cargo load lenght (see Figure 9-32 on page 9-158) assuming that the bins or containers are located against the retaining angle installed in forward position of each cargo section.



9_35

Figure 9-35. LOADING CHART - OCCUPANTS AND CARGO

BAGGAGE LOAD

COMBI CABIN CONFIGURATION (OPTION # 14)

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

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Figure 9-36. LOADING CHART - BAGGAGE

EQUIPMENT LIST

The following items, not included in the weight and balance information presented in Section 6 of the basic Pilot's Operating Handbook, must be considered integral part of the Equipment List when the airplane is arranged in either the CARGO or COMBI Configuration.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25	**EQUIPMENT/FURNISHINGS**					
25-20	PASSENGER COMPARTMENT					
	CARGO CONFIGURATION OPTION # 13					
	- Loading Panel with Retaining Angle Piaggio 80K191241-405	8.30	99.42	8.25	1	
	- Loading Panel Piaggio 80K191241-401	7.00	117.06	8.19	1	
	- Loading Panel with - Retaining Angle Piaggio 80K191241-405	8.30	134.42	11.16	1	
	- Loading Panel - Piaggio 80K191241-401	7.00	152.06	10.64	1	
	- Loading Panel with Retaining Angle	8.30	169.42	14.06	1	
	- Piaggio 80K191241-405 Loading Panel Piaggio 80K191241-401	7.00	187.06	13.09	1	
	- Fully Equipped Strap Piaggio S3S15BV125HRS	7.90	107.70	8.51	4	
	- Fully Equipped Strap Piaggio S3S15BV125HRS	7.90	142.70	11.27	4	
	- Fully Equipped Strap Piaggio S3S15BV125HRS	7.90	177.70	14.04	4	
	- Strap Fitting Piaggio 40340-14	0.88	107.70	0.95	8	
	- Strap Fitting Piaggio 40340-14	0.88	142.70	1.26	8	
	- Strap Fitting Piaggio 40340-14	0.88	177.70	1.56	8	
	- Armrest Protection, Left Piaggio 80M09TEMATARM	1.23	145.00	1.78	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
	CARGO CONFIGURATION (cont.) *OPTION # 13*					
	- Armrest Protection, Right Piaggio 80M10TEMATARM	1.45	135.00	1.96	1	
	- Emergency Escape Hood Eros 15-40F	2.80	61.02	1.71	1	
	- Goggles Eros MXP210-00	0.22	52.76	0.12	1	
	TOTAL CARGO Configuration (*)	77.94	139.28	108.55		
	(*) Nets and items below are not included in the TOTAL:					
	- Net Piaggio SK1375-B	11.68	a.r.	a.r.	a.r.	
	- Door Inflatable Seal Protection Piaggio 80-909781-001	0.93	a.r.	a.r.	1	
	- Portable Cabin Fire Extinguisher Amerex Corporation Model 352	4.80	58.60	2.81	1	

ATA No.	ITEM DESCRIPTION AND PART NUMBER		WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT (cont.)						
	COMBI CONFIGURATION OPTION # 14						
	- Fwd facing seat (RH) including belts					1	
	ERDA 303267-16	(1)	43.00	107.70	46.31		
	ERDA 303558-12	(2)	29.00	107.84	31.27		
	GEVEN AV03-2102-01	(3)	29.80	107.84	32.14		
	- Fwd facing seat (LH) including belts					1	
	ERDA 303267-15	(1)	43.00	107.70	46.31		
	ERDA 303558-11	(2)	29.00	107.84	31.27		
	GEVEN AV03-1102-01	(3)	29.80	107.84	32.14		
	- Loading Panel with Retaining Angle Piaggio 80K191241-405		8.30	136.00	11.29	1	
	- Loading Panel Piaggio 80K191241-401		7.00	152.06	10.64	1	
	- Loading Panel with Retaining Angle Piaggio 80K191241-405		8.30	169.42	14.06	1	
	- Loading Panel Piaggio 80K191241-401		7.00	187.06	13.09	1	
	- Fully Equipped Strap Piaggio S3S15BV125HRS		7.90	147.70	11.67	4	
	- Fully Equipped Strap Piaggio S3S15BV125HRS		7.90	177.70	14.04	4	
	- Strap Fitting Piaggio 40340-14		0.88	147.70	1.30	8	
	- Strap Fitting Piaggio 40340-14		0.88	177.70	1.56	8	
	- Armrest Protection, Left Piaggio 80M09TEMATARM		1.23	145.00	1.78	1	
	- Armrest Protection, Right Piaggio 80M10TEMATARM		1.45	135.00	1.96	1	
	- Emergency Escape Hood Eros 15-40F		2.80	61.02	1.71	1	
	(1)Arrangement with high comfort seats. (2)Arrangement with ERDA light seats. (3)Arrangement with GEVEN light seats.						

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
	COMBI CONFIGURATION (cont.) *OPTION # 14*					
	- Goggles Eros MXP210-00	0.22	52.76	0.12	1	
	TOTAL COMBI Configuration (*) (1) (2) (3)	 139.86 111.86 113.46	 125.73 130.32 130.00	 175.85 145.77 147.50		
	(*) Nets and items below are not included in the TOTAL:					
	- Net Piaggio SK1375-B	11.68	a.r.	a.r.	a.r.	
	- Door Inflatable Seal Protection Piaggio 80-909781-001	0.93	a.r.	a.r.	1	
	- Portable Cabin Fire Extinguisher Amerex Corporation Model 352	4.80	58.60	2.81	1	
	(1)Arrangement with high comfort seats.					
	(2)Arrangement with ERDA light seats.					
	(3)Arrangements with GEVEN light seats.					

SECTION 7 – DESCRIPTION AND OPERATION

CARGO CONFIGURATION

To secure the load when stowed in the approved bins, up to twelve tie-down straps and 24 tie-down fittings can be installed in the cabin.
A minimum of four straps and 8 tie-down fittings , for each loading section, must be used.

When the load is carried in approved top-open containers (metal, wood, etc.), in addition to the four straps, 1 net must be used with at least 4 additional tie-down fittings.

Each strap assembly consists of two segment straps, one of fixed length, one of adjustable length with a center buckle to tigh the straps, that are provided, at each end with a hook.

The hooks, at both the ends of straps, must be engaged on the rings of the tie-down fittings previously installed on the seat rails.

Each net assembly is provided with 8 straps adjustable in length with 8 buckles to tigh the loads, and a hook at each end.
Four additional tie down fittings are provided with the nets to engage the net's hooks in flight direction.

Do not engage, in flight direction, net's hooks and straps hooks in the same tie-down fitting (see Figure 9-31 on page 9-157).

Cargo load in the baggage compartment (if required) must be secured with the baggage compartment net.

An armrest protection is provided to be installed for armrest protection during loading/de-loading operations.

A door seal protection is provided to be installed for door seal protection during loading/de-loading operations.

COMBI CONFIGURATION

To secure the load when stowed in the approved bins, up to eight tie-down straps and 16 tie-down fittings can be installed in the cabin.
A minimum of four straps and 8 tie-down fittings , for each loading section, must be used.

When the load is carried in approved top-open containers (metal, wood etc.), in addition to the four straps, 1 net must be used with at least 4 additional tie-down fittings.

Each strap assembly consists of two segment straps, one of fixed length, one of adjustable length with a center buckle to tigh the straps, that are provided, at each end with a hook.

The hooks, at both the ends of straps, must be engaged on the rings of the tie-down fittings previously installed on the seat rails.

Each net assembly is provided with 8 straps adjustable in length with 8 buckles to tigh the loads, and a hook at each end.
Four additional tie-down fittings are provided with the nets to engage the net's hooks in flight direction.

Do not engage, in flight direction, net's hooks and straps hooks in the same tie-down fitting as shown in Figure 9-31 on page 9-157 for CARGO configuration.

Cargo load in the baggage compartment (if required) must be secured with the baggage compartment net.

An armrest protection is provided to be installed for armrest protection during loading/de-loading operations.

A door seal protection is provided to be installed for door seal protection during loading/de-loading operations.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 13 FOR THE PROTECTIVE BREATHING EQUIPMENT EMERGENCY ESCAPE HOOD EROS P/N 15-40F

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the EROS P/N 15-40F Emergency Escape Hood is installed.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and the Approved Airplane Flight Manual.

The emergency escape hood provides automatic oxygen flow and smoke protection to crew members in case of smoke detection and fire extinguishing in the cabin, if requested. The hood may be used during flight at each cabin altitude when the cabin pressurization control system is operative or up to 25000 feet cabin altitude in the event the cabin pressure control system is inoperative.

SECTION 2 – LIMITATIONS

Use of emergency escape hood is allowed only when the cabin is pressurized or the cabin altitude is below 25000 feet.

PLACARDS

On the outside of cabinet where the hood is stowed:

PROTECTIVE BREATHING EQUIPMENT INSIDE

On the inside of cabinet where the hood is stowed:

**USE ONLY WHEN CABIN IS PRESSURIZED
OR CABIN ALTITUDE BELOW 25000 FT**

SECTION 3 – EMERGENCY PROCEDURES

SMOKE OR FIRE IN CABIN

If smoke or fire is located in the cabin compartment:

1. Locate the source of smoke or fire.
2. Don the emergency escape hood following the operating instruction pictograms located on the hood box.
   a. Oxygen is automatically supplied after donning. Oxygen flow noise inside the hood must be heard.
   b. Autonomy depends on work load, but it shall be not less than 15 minutes.

WARNING

Use Emergency Escape Hood only when cabin is pressurized or cabin altitude below 25000 feet.

SECTION 4 – NORMAL PROCEDURES

WARNING

Use Emergency Escape Hood only when cabin is pressurized or cabin altitude below 25000 feet.

PREFLIGHT CHECK

1. "Good Condition" indicator on upper side of cover - CHECK GREEN

SECTION 5 – PERFORMANCE

No changes to the basic performances provided by Section 5 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the Protective Breathing Equipment is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
35	**OXYGEN**					
35-30	PORTABLE					
	PROTECTIVE BREATHING EQUIPMENT					
	- Emergency Escape Hood Eros 15-40F	2.80	61.02	1.71	1	

SECTION 7 – DESCRIPTION AND OPERATION

A smokehood EROS P/N 15-40F is installed close to the crew and its location is identified by a red writing placard. The smokehood is designed for protection of aircraft crew against effects of:

– smoke and toxic gases
– hypoxia, in case of decompression, with cabin altitude below 25000 feet.

The oxygen annular container capacity is 39 liters NTPD. The smokehood is equipped with:

– flexible hood
– rigid visor
– compressed oxygen capacity
– automatic priming device plus a fuse valve
– two soda lime cartridges, acting as CO2 and humidity absorbers
– a pressure control valve regulating a 1÷2 mb overpressure inside the hood
– phonic membrane facilitating communications with the outside.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

The equipment does not require any maintenance since it is static, vacuum-packed and is provided with a "good condition indicator". Inspection is limited to preflight check of the good condition indicator located on the upper side of cover. If the indicator has turned from green to red, signal is given that a leakage of the cylinder may have occurred and that therefore the 15 minutes hood autonomy might not be reached. Hood should then be removed from aircraft and returned to the factory for inspection. Service life of the hood is 10 years.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 14 FOR THE FIRST AID OXYGEN EQUIPMENT

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual the first aid medical oxygen mask (EROS P/N MW37-33) and the additional outlet valve (EROS P/N DPB181-01) are installed.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and the Approved Airplane Flight Manual.

The First Aid Oxygen system consists in an additional outlet valve connected to the pilot's main oxygen line and located in a convenient position in the airplane cabin depending on the type of airplane interior configuration. A medical oxygen mask with a metered two flow selector provides oxygen flow at 2 lpm NTPD or at 4 lpm NTPD.

SECTION 2 – LIMITATIONS

1. Do not use the first aid oxygen equipment when the cabin altitude exceeds 31000 feet.
2. When in use, the metering selector of the first aid oxygen mask must be set to 4 in the event of cabin decompression and when the cabin altitude is above 17000 feet.

PLACARDS

On the outside of cabinet where the mask is stowed:

FIRST AID MEDICAL OXYGEN MASK INSIDE

On the oxygen outlet valve cover:

OXYGEN

Close to the oxygen outlet valve:

DO NOT SMOKE WHILE OXYGEN IS IN USE

SECTION 3 – EMERGENCY PROCEDURES

Change the corresponding basic POH procedures as follows:

RAPID OR EXPLOSIVE DECOMPRESSION (CAB PRESS LIGHT ON)

1. Crew and passenger oxygen - MANUAL MASK RELEASE/DON MASKS
2. Oxygen mask microphone - MASK
3. Emergency bleed air switch - EMER
4. EMERGENCY DESCENT Procedure - PERFORM down to 12000 ft.
5. Emergency bleed air switch - OFF

If first aid oxygen is needed:

6. EMERGENCY DESCENT Procedure - PERFORM down to 8000 ft if possible
7. Crew and passengers oxygen - PILOT ONLY
8. First aid oxygen mask - DON

CABIN ALTITUDE ABOVE 9,500 FETT (CAB PRESS LIGHT ON)

1. Crew and passenger oxygen - MANUAL MASK RELEASE/DON MASK
2. Oxygen mask microphone - MASK
3. Bleed air switches - VERIFY L and R position
4. Cab sel/Auto sched switch - MAN
5. Manual controller switch - DN
6. Rate control knob - AS DESIRED

If cabin altitude continues to increase:

7. Emergency bleed air switch - EMER
8. EMERGENCY DESCENT Procedure - PERFORM IF REQUIRED down to 12000 ft.
9. Emergency bleed air switch - OFF

If first aid oxygen is needed:

10. EMERGENCY DESCENT Procedure - PERFORM down to 8000 ft if possible
11. Crew and passengers oxygen - PILOT ONLY
12. First aid oxygen mask - DON

NOTE

During Emergency Descent to 8000 ft the oxygen flow supplied by the normal passengers' oxygen masks is higher than the oxygen flow supplied by the first aid mask.
To guarantee adequate first aid oxygen duration, following an Emergency Descent, switch to PILOT ONLY as soon as 8000 ft flight altitude are reached.

SECTION 4 – NORMAL PROCEDURES

The first aid oxygen is available at any time, during flight, connecting the appropriate oxygen mask (P/N MW37-33) to the outlet valve. The oxygen flow can be set to 2 lpm or 4 lpm.
In case of use of the first aid oxygen for all the flight duration with cabin pressurization operative, in order to maintain the main oxygen system compliance with FAR 91, set the metering selector to 2 lpm.

CAUTION

Do not use First Aid Oxygen Equipment when cabin altitude exceeds 31000 feet.

Set flow selector to 4 lpm when cabin altitude is above 17000 feet.

Do not smoke while oxygen is in use.

SECTION 5 – PERFORMANCE

No changes to the basic performances provided by Section 5 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the First Aid Oxygen Equipment is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
35	**OXYGEN**					
35-20	PASSENGER					
	FIRST AID OXYGEN EQUIPMENT					
	Oxygen Mask, First Aid Medical Eros MW37-33	1.00	61.02	0.61	1	

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SECTION 7 – DESCRIPTION AND OPERATION

The system complies with FAR 25.1443(d) requirements. An additional oxygen system line connectes the crew line of the main oxygen system to a supplementary oxygen outlet valve. The location of the first aid oxygen outlet valve depends on the type of airplane interior configuration. The outlet valve is protected by a cover marked OXYGEN.

Oxygen is always available to the first aid oxygen outlet valve.

The first aid oxygen mask is provided with:

- a coupling with a two flows metered selector which allows the oxygen to flow at 2 lpm NTPD or at 4 lpm NTPD. The two flows are identified as "2" and "4" on the selector body.
- a vinil reservoir bag with a flow indicator compartment
- a yellow silicon cup equal to that one used for the passengers oxygen masks installed inside the drop-out boxes.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 15 FOR THE ALTERNATE STATIC AIR SOURCE SYSTEM

SECTION 1 – GENERAL

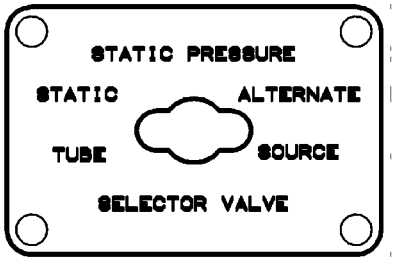
This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Alternate Static Air Source System is installed on the P.180 airplane.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The airplane can be normally operated for all kind of operations without the Alternate Static Air Source installed. However some Certification Authorities may require the Alternate Static Air Source System installation for particular kind of operations (i.e. Commercial Air Transport).

SECTION 2 – LIMITATIONS

PLACARDS

Below the left section of the instrument panel, in front of the pilot control column:



SECTION 3 – EMERGENCY PROCEDURES

LEFT NORMAL STATIC AIR SOURCE MALFUNCTION

1. Static pressure selector valve - ALTERNATE SOURCE after lifting the spring-clip retainer
2. Airspeed and altimeter calibration - Refer to Section 5 of this Supplement

NOTE

All the indicated airspeed and altitude reported in the basic POH are referred to the normal static source (STATIC TUBE). Apply the appropriate correction when using the alternate static air source system.

SECTION 4 – NORMAL PROCEDURES

BEFORE ENGINE STARTING

1. Static pressure selector valve - CHECK STATIC TUBE and secured with the spring-clip retainer

SECTION 5 – PERFORMANCE

When the alternate static air source is selected, the following airspeed, altimeter and mach number corrections must be considered in addition to the graphs provided at Section 5 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

AIRSPEED CALIBRATION

Add 1.5 KIAS to the graph provided at Section 5 of the basic Pilot's Operating Handbook.

ALTIMETER CALIBRATION

Add:

– 50 feet (maximum inaccuracy) up to 30000 feet
– 80 feet (maximum inaccuracy) above 30000 feet

to the graph provided at Section 5 of the basic Pilot's Operating Handbook

MACH CALIBRATION

Add 0.006 to the graph provided at Section 5 of the basic Pilot's Operating Handbook.

NOTE

The calibration provided in this Section are valid for zero sideslip.

SECTION 6 – WEIGHT AND BALANCE

When the Alternate Static Air Source System is installed the following items must be added to the Equipment List at Section 6 "Weight and Balance" of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-10	FLIGHT ENVIRONMENT DATA					
	ALTERNATE STATIC AIR SOURCE SYSTEM (Optional)					
	- Static Pressure Selector Valve MS28051-1	0.60	19.00	0.11	1	
	- Static Port Aero Instrument Co. ST344-2GP	0.43	102.30	0.44	1	
	- Piping	0.28	20.00	0.06	1	

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SECTION 7 – DESCRIPTION AND OPERATION

In addition to normal static system as described in the Section 7 of the basic Pilot's Operating Handbook, an optional alternate static air line for the pilot instruments can be installed.

The alternate system consists of a selector valve connected to the pilot's normal static air line and to analternate line that obtains static air from a heated static port located on the fuselage close the main right static port.

In the event of a failure of the pilot's normal static air source, the alternate source should be selected by lifting the spring-clip retainer of the STATIC PRESSURE SELECTOR VALVE handle, located in front of the control column just below the instrument panel, and moving the handle to the ALTERNATE SOURCE position. This will disconnect the normal static air line and connect the alternate static air line to the pilot's flight instruments.

The pilot's altimeter, vertical speed indicator, and airspeed indicator are normally connected to the pilot's (left) static airs ource. When the system is switched to the pilot's alternate air source, the pilot's altimeter and vertical speed indicator are affected as well as the pilot's airspeed indicator. The copilot's airspeed indicator, altimeter, and vertical speed indicator are all on the copilot's (right) static air source and cannot be switched to alternate source.

The alternate static port heater is switched on when the right pitot static heater switch is set to the R position. 28 VDC power is supplied through the R PITOT ST HTR circuit breaker.

NOTE

The pilot's airspeed and altimeter calibration change when the alternate static air source is in use. Refer to the PERFORMANCE Section of this Supplement for operation when the alternate static air source is in use.

When the alternate static air source is not needed, ensure that the STATIC PRESSURE SELECTOR VALVE handle is held in the normal (STATIC TUBE) position by the spring-clip retainer.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

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SECTION 2 – LIMITATIONS

The following limitations apply to the P.180 airplane when equipped with the Collins EFIS-85B4 (Electronic Flight Instrument System) 3 tube version:

a) The DRIVE XFER-NORM switch must be checked for proper operation in both the DRIVE XFER and NORM modes prior to flight.

b) The EADI COMP-NORM-EHSI COMP switch must be checked for proper operation in all the three positions prior to flight.

c) Multifunction display PGE (page) and EMG (emergency) check lists are for reference purposes only. The Approved Pilot's Operating Handbook incorporates the approved procedures for all operations.

d) Back course approaches are prohibited in the APPR, ENR, EADI COMP and EHSI COMP formats.

e) Operation in either EADI COMP or EHSI COMP formats in IFR conditions is limited to emergency use only. Take-off not permitted using composite formats.

f) Use of APPR and ENR formats for approaches is limited to the inbound front course only.

g) Primary Vertical Gyro, Secondary Vertical Gyro Stand-by Gyro Horizon must be serviceable as well as the main avionics fan ("AVCS FAN FAIL". annunciator OFF).

SECTION 3 – EMERGENCY PROCEDURES

EMERGENCY PROCEDURES CHECKLIST

NOTE

Detailed information on each warning flag which might appear on the EFIS displays is contained in Section 7 "System Description and Operation" of this Supplement.

a) LOSS OF PRIMARY ATTITUDE DATA
XSIDE ATT-NORM switch - ATT

If attitude data is not restored:
Refer to back-up data

b) LOSS OF PRIMARY COMPASS DATA
XSIDE HDG-NORM switch - HDG

If heading data is not restored:
Refer to back-up data

c) LOSS OF EHSI DISPLAY
EADI COMP-NORM-EHSI COMP switch - EADI COMP

d) LOSS OF EADI DISPLAY
EADI COMP-NORM-EHSI COMP switch - EHSI COMP

e) DPU FAIL ANNUNCIATOR ON OR LOSS OF BOTH EADI AND EHSI DISPLAY
DRIVE XFER-NORM switch - DRIVE XFER
DPU 1 circuit breaker - PULL

If displays are not restored:
HSI 1 circuit breaker - PULL
ADI 1 circuit breaker - PULL
EADI COMP-NORM-EHSI COMP switch - EHSI COMP

f) EFD FAN ANNUNCIATOR ON

CAUTION

Limit the EHSI operation as much as possible. off

EADI COMP-NORM-EHSI COMP switch - EADI COMP

g) MFD FAN ANNUNCIATOR ON
MFD operation - MONITOR

In the event of malfunction:
MFD circuit breaker - PULL

h) DPU FAN ANNUNCIATOR ON
DRIVE XFER-NORM switch - DRIVE XFER
DPU 1 circuit breaker - PULL

i) MPU FAN ANNUNCIATOR ON
MFD operation - MONITOR

In the event of malfunction:
MFD circuit breaker - PULL
MPU-L circuit breaker - PULL

j) AVCS FAN FAIL ANNUNCIATOR ON
OAT - MONITOR
Avoid long time operation in hot atmosphere

Otherwise:
Non-essential avionics equipment circuit breakers - PULL

k) DSP WARNING FLAG ON

CAUTION

Last selections before DSP failure remain effective for both EADI and EHSI .
Autopilot lateral modes operation is limited to heading-hold only (vertical modes are not affected).

PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 16 FOR THE PITOT HEAT INDICATION SYSTEM

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Pitot Heat Indication System (Kit P/N 80KA00037-801) is installed on the P.180 airplane.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The Pitot Heat Indication System provides a visual alert, through a dual amber caution light indicator, of the non-operational status of the left and right pitot heating systems.

SECTION 2 – LIMITATIONS

No changes to the basic Limitations provided by the Section 2 of the Pilot's Operating Handbook are necessary for this supplement.

SECTION 3 – EMERGENCY PROCEDURES

L/R PITOT HEAT ANNUNCIATOR (L PITOT/R PITOT CAUTION LIGHT ON)

1. PITOT/STATIC HTR switch - CHECK L & STALL/R
2. L/R PITOT ST HTR circuit breaker - CHECK IN
3. PITOT/STATIC HTR switch - OFF then L & STALL/R

If L/R PITOT caution light persists illuminated rely on the other pilot's pressure instruments.

SECTION 4 – NORMAL PROCEDURES

BEFORE TAXI

While performing Pitot heating system check ensure the L PITOT/R PITOT caution light illuminates whenever the corresponding switch is set to OFF position.

BEFORE TAKEOFF

1. L/R PITOT caution lights - CHECK OFF

NOTE

Pitot heat indication system operation is prevented following a STALL WRN circuit breaker trip.

SECTION 5 – PERFORMANCE

No changes to the basic Performances provided by the Section 5 of the Pilot's Operating Handbook are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

No significant changes to the basic Weight and Balance information provided by the Section 6 of the Pilot's Operating Handbook are necessary for this supplement.

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SECTION 7 – DESCRIPTION AND OPERATION

The pitot heat indication system consists of a dual amber indicator light and two current sensitive relays associated to each pitot heating system.
The dual indicator light, installed on the pilot's instrument panel, consists of two sections, word readout type, marked L PITOT and R PITOT respectively.
Each section is driven by the corresponding current sensitive device.

The current sensitive relays, installed on the lines supplying power to the pitot heaters, monitor the current to the heating elements. The electrical power feeding the current sensitive relays is supplied through the stall warning circuit breaker, allowing the indication system operation also in the event of L/R PITOT ST HTR circuit breaker trip.
Positive indication is provided whenever:

– pitot heater is switched off, and
– pitot heater is switched on but the heating elements absorbe less current than a minimum value expected under all operating conditions.

During preflight tests the pilot can check the proper operation of the system by switching on then off the pitot heating systems.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 17 FOR THE AIR AMBULANCE CONFIGURATION

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Air Ambulance Kit is installed. This supplement applies to the different Airambulance configurations listed in the table below.

Table 1

Configuration	Vendor	Piaggio Kit P/N
A	Egan Aviation	80KM00005 80KA00031
B	LifePort Inc.	80KM00008 80KA00031
C	LifePort Inc.	80KI00017 80KA00031

The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The Air Ambulance Kit is available for installation in the cabin compartment, after partial or total removal of passenger accomodations, cabinets and partitions depending on the interior configuration of the airplane.
One or two bases complete with stretcher, hereinafter called BLS (Basic Life Support), as well as accomodation for two medical assistants may be installed in the cabin.
Various medical equipment, such as oxygen, vacuum, air, 12 VDC and 230 VAC electrical sources, etc. may be either incorporated in the BLS either installed in the cabin depending on the configuration selected by the operator.

Specific paragraph are provided in the following Sections of this Supplement as applicable with reference at the different configurations listed in the above Table 1 .

SECTION 2 – LIMITATIONS

CAUTION

Use of any equipment connected to the BLS must be approved by the National Aviation Autority. Compliance with FAA AC 135-15 is considered acceptable.

WEIGHT LIMITS

When the Piaggio P/N 80-909828-801 support frame is installed a maximum weight of 31.0 lbs. of electromedical equipment can be installed at an arm of 131.50 inches.

SEATING/LITTER LIMITS

The maximum permissible number of BLS is 2 associated with 2 seats for medical assistants and 2 flight crew seats (pilot and copilot).

CAUTION

BLS must be installed so the patient is head forward oriented in the airplane.
The stretcher backrest, if installed, must be in the fully lowered position during taxi, take-off and landing.

CREW LIMITS

In addition to the normal crew one attendant for each stretcher occupant incapable of independently exit the airplane.

NOTE

The attendant/medical personnel should be familiarized with the use of the BLS systems.

PLACARDS

CONFIGURATION A - *Egan Aviation - Piaggio Kit 80KM00005*

On each BLS base:

WARNING: DO NOT SMOKE WHEN OXYGEN IS IN USE

The stretcher backrest must be in the lowest position during take-off and landing.

WARNING

Improper use or maintenance of an oxygen system may result in injury or death. Personnel must receive adequate training prior to use and/or maintenance. SEE MIL SPEC O-27210, NFPA 410-1980.

WARNING

All service or overhaul performed on this apparatus shall be done ONLY by those facilities experienced in, or by personnel knowledgeable in high pressure aviation oxygen equipments. This includes installation and removal of the oxygen tank.

OXYGEN BOTTLE VALVE MUST BE CLOSED AFTER LANDING AND WHEN OXYGEN IS NOT IN USE.
IN THE EVENT OF CABIN DEPRESSURIZATION USE THE OXYGEN AIRPLANE MASK IF THE MEDICAL MASK IS NOT ABLE TO SUPPLY THE FOLLOWING MINIMUM RATE:

ALTITUDE FEET	MIN O_2 FLOW LPM
15000	1.1
25000	2.3
35000	3.5
40000	4.2

CONFIGURATION B - LifePort Inc. PIAGGIO KIT 80KM00008 and
CONFIGURATION C - LifePort Inc. PIAGGIO KIT 80KI00017

On each BLS base:

Wording	Color
Above the oxygen door	
ENSURE LIFELOCK ARE FULLY ENGAGED BEFORE FLIGHT	Orange
PATIENT MUST BE SECURED BEFORE FLIGHT	Orange
BACKREST IN LOWEST POSITION FOR TAKE-OFF AND LANDING	Orange
On the oxygen door	
NO SMOKING	Red
OXYGEN FILL PORT ACCESS	Green
OXYGEN SHUT-OFF BACKSIDE	Green
HIGH PRESSURE OXYGEN	Green
FILL 2216 PSIG	Green
CAUTION USE NO OIL	Orange
OXYGEN SHUT-OFF MUST BE CLOSED AFTER LANDING AND WHEN OXYGEN IS NOT IN USE	Green
IN THE EVENT OF CABIN DEPRESSURIZATION USE THE AIRCRAFT OXYGEN MASK IF THE MEDICAL EQUIPMENT IS NOT ABLE TO SUPPLY THE FOLLOWING MINIMUM FLOW:	Green

ALTITUDE FEET	MINIMUM FLOW LPM
15000	1.1
25000	2.3
35000	3.5
40000	4.2

SECTION 3 – EMERGENCY PROCEDURES

EVACUATION OF NON-AMBULATORY PATIENTS

In the event of an emergency evacuation, the attendant/medical personnel required at Section 2 "Limitations" of this Supplement is responsible for evacuating the non-ambulatory stretcher occupants.

EVACUATION VIA CABIN DOOR

1. Open cabin door.
2. Prepare each patient for evacuation.
3. Remove each patient from the stretcher.
4. Drag each patient by lifting under both arms and backing through the door.

EVACUATION VIA EMERGENCY EXIT DOOR

1. Open emergency exit door.
2. Prepare each patient for evacuation.
3. Allow pilot exit first.
4. Remove each patient from the stretcher.
5. Drag each patient by lifting under both arms and backing towards the emergency exit.
6. Put the patient leg through the emergency exit.
7. Lift the patient and allow sliding through the emergency exit.
8. The pilot lowers the patient to the ground.

IN THE EVENT OF EXCESSIVE ELECTRICAL LOAD

1. Pilot informs attendant/medical personnel and request for a BLS electrical load reduction.
2. Reduce electrical load.
3. Monitor electrical load.

If excessive electrical load continues:

4. Pilot informs attendant/medical personnel and request to switch off all electrical loads.

IN THE EVENT OF DUAL GENERATOR FAILURE

1. Pilot informs attendant/medical personnel of a zero electrical power situation and request to switch off all electrical loads.

IN THE EVENT OF LITTER BREAKER TRIPPED

1. Push to reset the circuit breaker.
2. If the circuit breaker trips again do not reset until the cause of the circuit malfunction is determined and corrected.

SECTION 4 – NORMAL PROCEDURES

NORMAL PROCEDURES CHECK LIST

CONFIGURATION A - Egan Aviation - Piaggio Kit 80KM00005

PREFLIGHT CHECK

1. Check correct location of interior components.

Before patients loading check litter components operation:

2. Check oxygen bottle pressure and oxygen system operation.
3. Check ventilation and vacuum pump operation.
4. Check inverter operation.

NOTE

230 VAC output voltage at 50 Hz with a maximum available power of 330 VA.

After patients loading:

5. Check proper installation of the stretcher on the litter base with head forward oriented patient.
6. Check proper installation of the stretcher securing pins.
7. Check proper installation of patient safety belts.

CONFIGURATION B - LifePort Inc. - PIAGGIO KIT 80KM00008 and
CONFIGURATION C - LifePort Inc. - PIAGGIO KIT 80KI00017

PREFLIGHT CHECK

1. Check correct location of interior components.
2. Check proper installation of the stretcher on the BLS base.
3. Check each stretcher occupant is properly secured with the restraint harness.
4. Check oxygen system charge and operation.
5. Check the AIR system operation.
6. Check the VACUUM system operation.
7. Check the inverter operation.

NOTE

230 VAC output voltage at 50 Hz with a maximum available power of 330 VA.

8. Check the converter system operation.
9. Check the panel illumination operation.
10. Check all electromedical equipment are properly installed.

AMPLIFIED NORMAL PROCEDURES

CONFIGURATION A - Egan Aviation - Piaggio Kit 80KM00005

PREFLIGHT CHECK

Referring to the Air Ambulance interior configuration approved by the National Aviation Authority, the operator must verify the correct location of the interior components.
Verify the oxygen bottle pressure is between 200 and 2000 PSIG. Remove the oxygen outlet port cap and momentary open oxygen bottle shutoff. Check the oxygen flows through the outlet port.
Refer to the "Oxygen Capacity vs. Pressure" graph of Figure 9-43 on page 9-221 at Section 8 of this Supplement.
Remove ventilation outlet port cap, check the AIR breaker is depressed and momentary move to ON the AIR switch. Verify the air flows through the outlet port. Reinstall the outlet port cap.
Remove suction port cap, check the SUCTION breaker is depressed and momentary move to ON the SUCTION switch. Verify air suction through the suction port. Reinstall the suction port cap.
Verify the INVERTER and the 220 VAC breakers are depressed. Move to ON the INVERTER switch. Verify the 220 VAC power is available at power connection. Move to OFF the INVERTER switch.
When imboarding check the stretchers are correctly installed on the BLS and safetied with the securing pins. The stretcher must be positioned so the patients are head forward oriented in the airplane. Check the patients are properly secured with safety belts.

CONFIGURATION B - LifePort Inc. - PIAGGIO KIT 80KM00008 and
CONFIGURATION C - LifePort Inc. - PIAGGIO KIT 80KI00017

PREFLIGHT CHECK

Referring to the Air Ambulance interior configuration approved by the National Aviation Authority, the operator must verify the correct location of the interior components.
Slide Aerosled on the BLS base until fastening pins engage the latches. Check the correct engagement of all the four pins: trying to rock the stretcher from each end is an acceptable checking method. Stretchers occupants must be head forward oriented in the airplane.
Each stretcher occupant shall be secured by means of the restraint harness during taxi, takeoff and landing operations.

Each restraint harness is installed as required to fit each individual occupant. The shoulder straps are passed over the occupant shoulders and fastened through the buckle of the torso belt. The thigh belt is secured over the lover limbs of the occupant.
Check the oxygen bottle pressure is between 200 and 2216 PSIG. Check oxygen quantity in the bottle: refer to the "Oxygen Capacity vs. Pressure" graph of Figure 9-44 on page 9-224 at Section 8 of this Supplement.

NOTE

Avoid, if possible, bottle pressure decreasing below 400 PSIG. Oxygen will be still delivered but flow fluctuation at the outlet may be evidenced.

Two circuit breakers are installed on the BLS just downstream to the main 28 VDC input connector.
Check the above two circuit breakers are depressed.
Check the oxygen flow by opening the bottle shutoff and plugging in the suitable type plug. Oxygen should flow for at least 3 seconds.
Check the AIR breaker is depressed and momentary move to ON the AIR switch: air pressure gage reading should be not less than 55 ÷ 60 PSIG. Plug in the suitable type plug for checking the air flow.
Check the VACUUM breaker is depressed and momentary move to ON the VACUUM switch: vacuum pressure gage reading should be not less than –20 ÷ –22 inches Hg. Plug in the suitable type plug for checking suction at the vacuum port.
Depress INV HOT circuit breaker then set ON the INV switch and check the INV red light illuminates.
Depress CONV circuit breaker then set ON the CONV switch and check the CONV red light illuminates.
Depress PNL circuit breaker then set ON the PNL switch and check the panel lights illuminate.
Check the electromedical equipment are positively secured and related supporting frame properly fastened. Check the electrical cables for correct connection to the BLS power sockets and to the electromedical equipment rack sockets.

NOTE

Primary airplane electrical loads shall take precedence on medical system loads when an electrical load shedding is required.

SECTION 5 – PERFORMANCE

No changes to the basic performances provided by Section 5 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the airplane is arranged in the Air Ambulance Configuration.
Cabin interior may be reconfigured by installing a combination of airambulance certified components and interior certified components listed in the Section 6 of basic Pilot's Operating Handbook and Approved Flight Manual only if the airplane Center of Gravity limits are not exceeded and the operator obtains the related National Aviation Authority approval.
After cabin reconfiguration the new airplane basic weight, arm and moment must be determined and entered in the "Weight and Balance Record" form at Section 6 of the basic Manual.
The operator must ensure the airplane is loaded within the Weight, Moment and Center of Gravity limits envelope at Section 6 of the basic Manual.

CONFIGURATION A - Egan Aviation - Piaggio Kit 80M00005

OCCUPANTS

WEIGHT LBS	CREW SEATS ARM 49.20 IN	LITTER 1 ARM 125.37 IN	LITTER 2 ARM 140.22 IN	SEAT (*) 3 ARM 191.50 IN	SEAT 4 ARM 218.18 IN	SEAT (**) 3 ARM 190.84 IN
	MOMENT (LBS · IN/100)					
100	49.20	125.37	140.22	191.50	218.18	190.84
110	54.12	137.91	154.24	210.65	240.00	209.92
120	59.04	150.44	168.26	229.80	261.82	229.01
130	63.96	162.98	182.29	248.95	283.63	248.09
140	68.88	175.52	196.31	268.10	305.45	267.18
150	73.80	188.01	210.33	287.25	327.27	286.26
160	78.72	200.59	224.35	306.40	349.09	305.34
170	83.64	213.13	238.37	325.55	370.91	324.43
180	88.56	225.67	252.40	344.70	392.72	343.51
190	93.48	238.20	266.42	363.85	414.54	362.60
200	98.40	250.74	280.44	383.00	436.36	381.68
210	103.32	263.28	294.46	402.15	458.18	400.76
220	108.24	275.81	308.48	421.30	480.00	419.85

(*) Use these data fot C.G. calculation with ERDA high comfort seat installed as per Equipment List.

(*) Use these data for C.G. calculation with ERDA or GEVEN light seat installed as per Equipment List.

NOTE

Seat 4 can be occupied during take off or landing only if the optional belted lavatory seat is installaed.

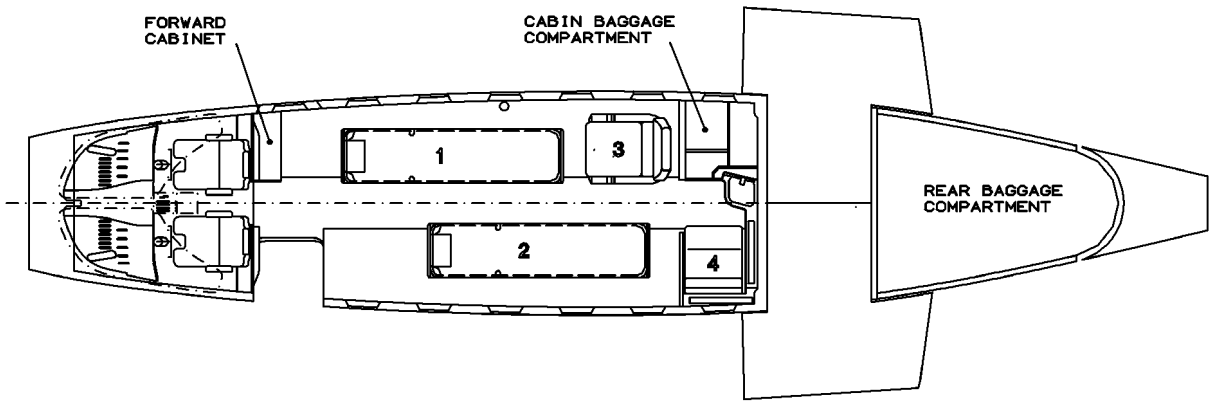

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Figure 9-37. LOADING CHART - OCCUPANTS

BAGGAGE

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

FM_9_38

Figure 9-38. LOADING CHART - BAGGAGE - CONFIGURATION A

CONFIGURATION B - Life Port Inc. - Piaggio Kit 80KM00008

OCCUPANTS

WEIGHT LBS	CREW SEATS ARM 49.20 IN	LITTER 1 ARM 128.10 IN	LITTER 2 ARM 141.60 IN	SEAT 3 ARM 190.84 IN	SEAT 4 ARM 218.18 IN
	MOMENT (LBS · IN/100)				
100	49.20	128.10	141.60	190.84	218.18
110	54.12	140.91	155.76	209.92	240.00
120	59.04	153.72	169.92	229.01	261.82
130	63.96	166.53	184.08	248.09	283.63
140	68.88	179.34	198.24	267.18	305.45
150	73.80	192.15	212.40	286.26	327.27
160	78.72	204.96	226.56	305.34	349.09
170	83.64	217.77	240.72	324.43	370.91
180	88.56	230.58	254.88	343.51	392.72
190	93.48	243.39	269.04	362.60	414.54
200	98.40	256.20	283.20	381.68	436.36
210	103.32	269.01	297.36	400.76	458.18
220	108.24	281.82	311.52	419.85	480.00

NOTE

Seat 4 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.

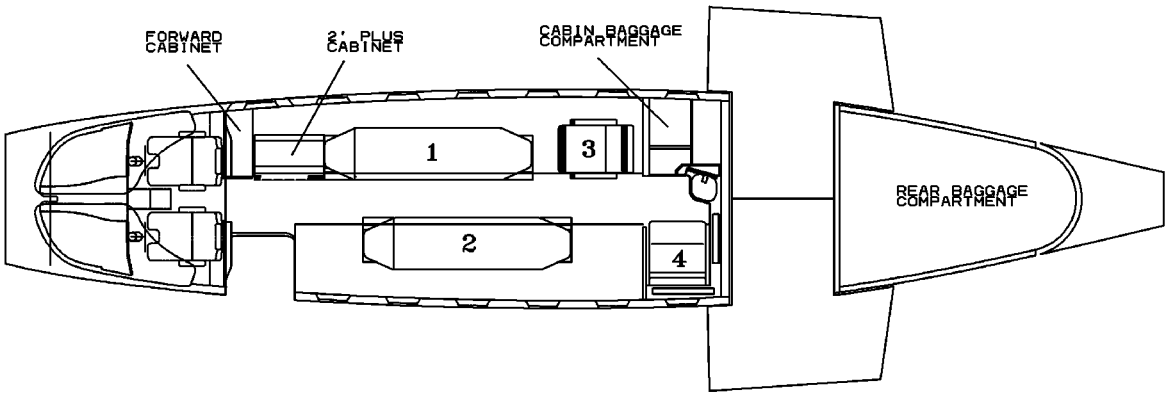

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Figure 9-39. LOADING CHART - OCCUPANTS

BAGGAGE

WEIGHT LBS	REAR BAGGAGE COMPARTMENT FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	2′ PLUS CABINET FS 71 TO 95 ARM 83.2 IN
	MOMENT (LBS · IN/100)
5	4.16
10	8.32
15	12.48
20	16.64
25	20.80
30	24.96
35	29.12
40	33.28

WEIGHT LBS	RH SIDE 6′ PLUS STOWAGE COMPARTMENT ARM 131.2 IN
	MOMENT (LBS · IN/100)
5	6.56
10	13.12
15	19.68
20	26.24

WEIGHT LBS	CABIN BAGGAGE COMPARTMENT FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	LH SIDE 6′ PLUS STOWAGE COMPARTMENT ARM 144.8 IN
	MOMENT (LBS · IN/100)
5	7.24
10	14.48
15	21.72
20	28.96

FM_9_40

Figure 9-40. LOADING CHART - BAGGAGE - CONFIGURATION B

CONFIGURATION C - LifePort Inc. - Piaggio Kit 80KM00007

OCCUPANTS

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 96.30 IN	LITTER 2 ARM 128.10 IN	LITTER 3 ARM 147.70 IN	SEAT 4 ARM 187.94 IN	SEAT 5 ARM 218.18 IN
	MOMENT (LBS · IN/100)					
100	49.20	96.30	128.10	147.70	187.94	218.18
110	54.12	105.93	140.91	162.47	206.73	240.00
120	59.04	115.56	153.72	177.24	225.53	261.82
130	63.96	125.19	166.53	192.01	244.32	283.63
140	68.88	134.82	179.34	206.78	263.12	305.45
150	73.80	144.45	192.15	221.55	281.91	327.27
160	78.72	154.08	204.96	236.32	300.70	349.09
170	83.64	163.71	217.77	251.09	319.50	370.91
180	88.56	173.34	230.58	265.86	338.29	392.72
190	93.48	182.97	243.39	280.63	357.09	414.54
200	98.40	192.60	256.20	295.40	375.88	436.36
210	103.32	202.23	269.01	310.17	394.67	458.18
220	108.24	211.86	281.82	324.94	413.47	480.00

NOTE

Seat 5 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.

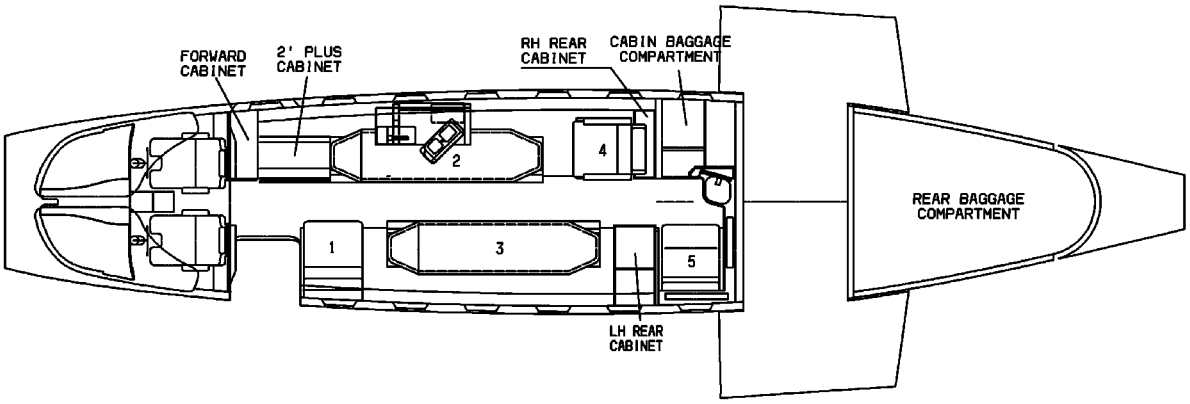

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Figure 9-41. LOADING CHART - OCCUPANTS

BAGGAGE

WEIGHT LBS	REAR BAGGAGE COMPT. FS 275 TO 320 ARM 298 IN
	MOMENT (LBS · IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN
	MOMENT (LBS · IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	CABIN BAGGAGE COMPT. FS 208 TO 232 ARM 220 IN
	MOMENT (LBS · IN/100)
10	22.00
20	44.00
30	66.00
40	80.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00

WEIGHT LBS	2' PLUS CABINET FS 71 TO 95 ARM 83.2 IN
	MOMENT (LBS · IN/100)
5	4.16
10	8.32
15	12.48
20	16.64
25	20.80
30	24.96
35	29.12
40	33.28

WEIGHT LBS	RH SIDE 6' PLUS STOWAGE COMPT. ARM 131.2 IN
	MOMENT (LBS · IN/100)
5	6.56
10	13.12
15	19.68
20	26.24

WEIGHT LBS	LH SIDE 6' PLUS STOWAGE COMPT. ARM 144.8 IN
	MOMENT (LBS · IN/100)
5	7.24
10	14.48
15	21.72
20	28.96

WEIGHT LBS	LH SIDE REAR CABINET FS 192 TO 206 ARM 197 IN
	MOMENT (LBS · IN/100)
5	9.85
10	19.70
15	29.55
20	39.40
25	49.25
30	59.10
35	68.95
40	78.80
45	88.65
50	98.50
55	108.35
60	118.20
65	128.05
70	137.90
75	147.75
78	153.66

WEIGHT LBS	RH SIDE REAR CABINET FS 198 TO 206 ARM 200 IN
	MOMENT (LBS · IN/100)
5	10.00
10	20.00
15	30.00
20	40.00
25	50.00
26	52.00

FM_9_42

Figure 9-42. LOADING CHART - BAGGAGE - CONFIGURATION C

PIAGGIO AERO

EQUIPMENT LIST

The following items, not included in the weight and balance information presented in Section 6 of the basic Pilot's Operating Handbook, must be considered integral part of the Equipment List when the airplane is arranged in an AIR AMBULANCE Configuration.

CONFIGURATION "A" - Egan Aviation - Piaggio Kit 80KM00005.

ATA No.	ITEM DESCRIPTION AND PART NUMBER		WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25	**EQUIPMENT/FURNISHINGS**						
25-20	PASSENGER COMPARTMENT						
	Piaggio Kit 80KM00005						
	- Litter Assembly (RH) Piaggio Dwg. 80-909792	(1)	143.33	129.50	185.61	1	
	- Litter Assembly (LH) Piaggio Dwg. 80-909792	(1)	143.33	144.35	206.90	1	
	- Fwd facing seat (RH)					1	
	ERDA 303267-4	(2)(3)	43.00	191.50	82.35		
	ERDA 303558-16	(4)	29.00	190.84	55.34		
	GEVEN A03-2113-01	(6)	29.80	190.84	56.27		
	- Carpet Assembly Piaggio Dwg. 80-909544	(5)	55.00	134.00	73.70	1	
	TOTAL AIR AMBULANCE	(3)	384.66	142.61	548.56		
		(4)	370.66	140.71	521.55		
		(6)	371.46	140.82	523.09		

(1) Litter Assembly includes stretcher and related belts.

(2) AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N (Belt weight included in seat weight).

(3) Arrangement with high comfort seat.

(4) Arrangement with ERDA light seat (Belt weight included in seat weight).

(5) Including cockpit and rear baggage compartment carpets.

(6) Arrangement wiht GEVEN light seat (Belt weight included in seat weight).

CONFIGURATION "B" - LifePort Inc. - Piaggio Kit 80KM00008.

ATA No.	ITEM DESCRIPTION AND PART NUMBER		WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25	**EQUIPMENT/FURNISHINGS**						
25-20	PASSENGER COMPARTMENT						
	Piaggio Kit 80KM00008						
	- 2' PLUS Unit LifePort Inc. 100-4568	(1)	27.50	83.20	22.88	1	
	- 6' PLUS Unit (RH) LifePort Inc. 366-4300	(2)	170.00	129.20	219.64	1	
	- Stretcher (RH) AeroSled TS LifePort Inc. 100-4065	(3)	34.40	131.20	45.13	1	
	- 6PLUSUnit(LH) LifePort Inc. 366-4300	(2)	170.00	146.80	249.56	1	
	- Stretcher (LH) AeroSled TS LifePort Inc. 100-4065	(3)	34.40	144.80	49.81	1	
	- Fwd facing seat					1	
	ERDA 303558-16	(4)	29.00	190.84	55.34		
	ERDA 303267-4	(5)	43.00	191.50	82.35		
	GEVEN AV03-2113-01	(9)	29.80	190.84	56.27		
	- Loading Ramp LifePort Inc. 100-4472	(6)	33.10	298.00	98.64	1	
	- Carpet Assembly Piaggio Dwg. 80-909544	(7)	55.00	134.00	73.70	1	
	TOTAL AIR AMBULANCE "B"	(8)					
		(4)	498.40	148.68	741.01		
		(5)	512.40	149.88	768.01		
		(9)	499.20	148.74	742.51		
	(1) Mounting plates included. (2) Mounting plates and full oxygen bottle included. (3) Shoulder Harness and belts included. (4) Arrangement with ERDA light seat (Belt weight included in seat weight). (5) Arrangement with high comfort seat. AIRCRAFT BELTS Inc. Shoulder Harness Model 53 installed as separate P/N (Belt weight included in seat weight). (6) Stowed in baggage compartment. (7) Optional. (8) Carpet weight not included. (9) Arrangement with GEVEN light seat (Belt weight included in seat weight).						

CONFIGURATION "C" - LifePort Inc. - Piaggio Kit 80KI00017.

ATA No.	ITEM DESCRIPTION AND PART NUMBER		WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25	**EQUIPMENT/FURNISHINGS**						
25-20	PASSENGER COMPARTMENT						
	Piaggio Kit 80KI00017						
	- 2' PLUS Unit LifePort Inc. 100-4568	(1)	27.50	83.20	22.88	1	
	- Side facing seat ERDA 160046-3	(4)	25.00	96.30	24.07	1	
	- 6' PLUS Unit (RH) LifePort Inc. Type 366/4300 Piaggio P/N 80-909841-801	(2)	170.00	129.20	219.64	1	
	- Stretcher (RH), AeroSled TS LifePort Inc. 100-4065	(3)	34.40	131.20	45.13	1	
	- Medical Equip. Support Frame Piaggio 80-909828-801		15.40	131.50	20.25	1	
	- 6' PLUS Unit (LH) LifePort Inc. Type 366-4300 Piaggio P/N 80-909841-801	(2)	170.00	152.76	259.69	1	
	- Stretcher (LH), AeroSled TS LifePort Inc. 100-4065	(3)	34.40	150.78	51.86	1	
	- Fwd facing seat GEVEN AV03-2113-02	(4)	34.00	187.94	63.90	1	
	- Rear Cabinet, LH side Piaggio 80-909817-801		35.30	197.00	69.54	1	
	- Rear Cabinet, RH side Piaggio 80-909818-801		14.80	200.00	29.60	1	
	- Loading Ramp LifePort Inc. 100-4472	(5)	33.10	298.00	98.64	1	
	- Carpet Assembly Piaggio Dwg. 80-909838-801		34.00	134.00	45.56	1	
	TOTAL AIR AMBULANCE "C"		627.90	151.42	950.76		
	(1) Mounting plates included. (2) Mounting plates and full oxygen bottle included (3) Shoulder Harness and belts included. (4) Belt weight included in seat weight. (5) Stowed in baggage compartment.						

SECTION 7 – DESCRIPTION AND OPERATION

A flush-mounted socket on each side of the cabin floor provides electrical power supply to each litter assembly. Suitable access panels are provided for the floor sockets protection when the litter assemblies are not installed.
Two 50-ampere circuit breakers are installed in the main junction box for protection of the feeding lines to the litter assemblies: one on the left generator bus for the left litter assembly and the other one on the right generator bus for right litter assembly.
At customer option, as alternate solution for allowing pilot's control of electrical power delivery to each litter assembly during all flight operations, two remotely controlled circuit breakers can be installed in the main junction box with the respective control circuit breakers located on the copilot circuit breaker panel, placarded respectively AUX1 for the left and AUX2 for the right litter assembly.

WARNING

Each time a litter assembly is to be either connected to or disconnected from the airplane electrical power supply, be sure the battery is OFF before the litter electrical plug is engaged in/disengaged from the airplane power connector.

NOTE

One or two BLS systems can be installed depending on the Air Ambulance configuration approved by the National Aviation Authority.

The following paragraphs provide a specific description for each airambulance configuration listed in Table 1 at Section 1 "General" of this Supplement.

CONFIGURATION A - Egan Aviation - Piaggio Kit 80KM00005

Each litter consists of:

1. an honeycomb base equipped with:
   - an oxygen system with a 111 cu.ft. (3140 liters) cylinder having a 2000 psi (138 Kg/ sq.cm.) service pressure, a shut-off valve, a filling valve, a pressure regulator, a pressure gauge, an outlet DISS port
   - a vacuum pump with outlet DISS port
   - a ventilation pump with DISS port
   - an inverter 28VDC-230VAC/50 Hz, 330 VA with two european connectors
   - control switch and breaker for each electrical component
2. a stretcher mounted on the base and secured with a pin at both ends.

The DISS oxygen, vacuum and ventilation have different type of fittings to avoid the possibility of wrong connections. A cap is provided to close the oxygen fitting during refilling.

WARNING

Positively NO SMOKING while oxygen is in use by anyone in the airplane.

Keep the entire system free from oil and grease (to avoid the danger of spontaneous combustion), moisture (to prevent the equipment from freezing at low temperatures) and foreign matter (to prevent the contamination of the breating oxygen with dust odors and clogging of any mechanisms).

CONFIGURATION B - LifePort Inc. - Piaggio Kit 80KM00008

This arrangement consists of one or two BLS systems, one cabinet, one load ramp and one forward facing seat.

Each Basic Life Support (BLS) system, fastened to the cabin seat tracks by means of suitable mounting plates, comprises:

1. one 6 feet Patient Loading Utility System (PLUS), consisting of a base that houses medical equipment, storage compartments and provisions for sliding, supporting and securing the patient
2. one 6-feet-long AeroSled TS single level stretcher

The cabinet (2 feet PLUS unit) is installed forward in the cabin just in front of the passenger door and is provided with connections for attaching the load ramp.

The load ramp can be connected to the cabinet for allowing an easier loading/unloading of the patients and, when not in use, can be folded and stowed in the baggage compartment.

Each 6 feet PLUS unit includes:

1. an oxygen system with a 122 cu.ft. (3455 liters) and 2216 psi (156 Kg/sq.cm.) cylinder, a pressure gauge, a filling valve, a manual shut-off valve on the cylinder head, a pressure regulator for a pressure delivery of approximately 60 psi and a Draeger type outlet port
2. a vacuum pump with Draeger type outlet port
3. a compressed air system with a pump, a pressure regulator for a pressure delivery of 60 psi (outlet pressure can be adjusted by the operator through a control knob on the pressure regulator), a 26 cu.in. accumulator, an air/water separator, a 5 micron filter and a Draeger type outlet port
4. a 28VDC-230VAC/50 Hz, 330 VA inverter with two european connectors
5. a 28VDC/12VDC 210 Watt converter with one european connector
6. a control panel lighting system
7. control switches and circuit breakers for each electrical system.

The Draeger type outlet ports for oxygen, vacuum and compressed air have different size fittings in order to avoid possible incorrect connections.

WARNING

Positively NO SMOKING while oxygen is in use by anyone in the airplane.
Oil, grease or other lubricants in contact with high pressure oxygen can create an extreme fire hazard. Any such contact must be avoided.

CONFIGURATION C - LifePort Inc. - Piaggio Kit 80KI00017

This arrangement consists of two BLS systems, one patient load ramp, one side-facing seat, one forward-facing seat, one forward cabinet and two rearward cabinets. Individual lifejacket and emergency liferaft stowage compartments are provided.

Each BLS system, fastened to the cabin seat tracks by means of suitable mounting plates, comprises:

1. one 6 feet Patient Loading Utility System (PLUS), consisting of a base that houses medical equipment, storage compartments and provisions for sliding, supporting and securing the patient
2. one 6-feet-long AeroSled TS single level stretcher

The forward cabinet (2 feet PLUS unit) is installed just in front of the cabin door.
The load ramp can be attached to suitable connections provided on the forward cabinet making easier patient loading/unloading and, when not in use, can be folded and stowed in the baggage compartment.

The two rear cabinets are located close to the aft cabin wall, the higer one on the left and the lower one on the right side. Both cabinets are provided with drawers for medical equipment storage, while the left side one can house the optional emergency liferaft in the lower section. Each 6 feet PLUS unit includes:

1. an oxygen system with a 122 cu.ft. (3455 liters) and 2216 psi (156 Kg/sq.cm.) cylinder, a pressure gauge, a filling valve, a manual shut-off valve on the cylinder head, a pressure regulator for a pressure delivery of approximately 60 psi and an outlet port
2. a vacuum pump with outlet port
3. a compressed air system with a pump, a pressure regulator for a pressure delivery of 60 psi (outlet pressure can be adjusted by the operator through a control knob on the pressure regulator), a 26 cu.in. accumulator, an air/water separator, a 5 micron filter and an outlet port
4. a 28VDC-230VAC/50 Hz, 330 VA inverter with two delivery connectors
5. a 28VDC/12VDC 210 Watt converter with four delivery connectors
6. a control panel lighting system
7. control switches and circuit breakers for each electrical system.

The outlet ports for oxygen, vacuum and compressed air have different size fittings in order to avoid possible incorrect connections.

WARNING

Positively NO SMOKING while oxygen is in use by anyone in the airplane. Oil, grease or other lubricants in contact with high pressure oxygen can create an extreme fire hazard. Any such contact must be avoided.

A suitable framework is installed on the right cabin wall for supporting a set of electromedical equipment. Refer to applicable Instruction Book (Piaggio Report No. 6643) for information about factory installed electromedical equipment.

WARNING

When a defibrillator is installed, only the self-adhesive type electrodes are allowed for use on board of the airplane. The use of any standard handle type electrodes must be absolutely avoided when on board of the airplane.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

A specific paragraph for each configuration is provided as needed.

CONFIGURATION A - Egan Aviation - Piaggio Kit 80KM00005

LITTER OXYGEN SYSTEM SERVICE

REFILLING THE SYSTEM

NOTE

MIL-O-27210 Aviators Breathing Oxygen must be used for filling the cylinder.

WARNING

Each time a litter is to be either connected to or disconnected from the airplane electrical power supply, be sure the battery is OFF before the litter electrical plug is engaged in/disengaged from the airplane power connector.

Remove the litter assembly from the airplane for refilling the oxygen cylinder.

Open the cylinder supply valve on the litter and fill the system slowly by adjusting the recharge rate with the pressure regulating valve on the cart. When the pressure on the cylinder reads 2000 psi at 70°F, close the pressure regulating valve.

OXYGEN SERVICING CHART

Ambient Temperature Degrees Fahrenheit	After Cooling Pressure Static PSIG	* Filling Pressure For 2000 PSI At 70 °F PSIG
0	1730	1820
10	1770	1860
20	1810	1910
30	1850	1950
40	1890	1980
50	1925	2020
60	1960	2050
70	2000	2100
80	2040	2130
90	2080	2170
100	2114	2210
110	2150	2240
120	2190	2280
130	2230	2320

* This column assumes 25 °F rise in temperature due to the heat of compression, and it assumes that the cylinders are being filled at their maximum rate.

CYLINDER TEST

As per the DOT 3AL specification 49CFR, section 173.34, published December 24, 1981, revised May 13, 1982, a 5 (five) year cylinder retest is required.

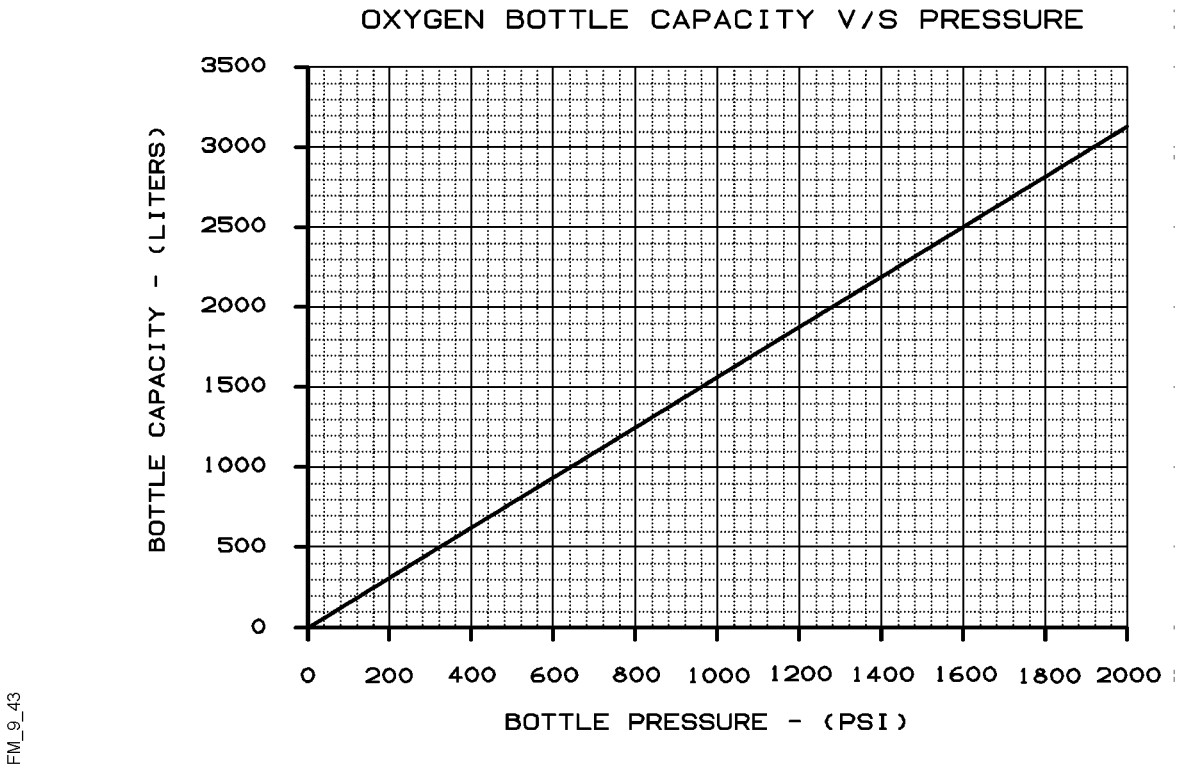

Figure 9-43. OXYGEN BOTTLE CAPACITY vs. PRESSURE at 21°C (70°F) - CONFIGURATION A

LEAKAGE TEST

Check the oxygen system for leaks at least once every six months:

1. STORED LITTER BASE SYSTEM

   a. Immediately after the storage perform the following test:

      1) plug the oxygen port located in the base front panel
      2) open the oxygen bottle valve
      3) check for leakage the oxygen port on the front panel (actually plugged) and the refilling valve (with plug installed)
      4) read the oxygen pressure on the guage located in the front panel
      5) record the oxygen pressure reading, the ambient temperature and the date of the test on a tag to be attached to the oygen bottle valve handle
      6) close the bottle valve and carely depressurize the lines by releasing the plug.

b. After six months of storage repeat the above test.

In the event the actual ambient temperature is the same one recorded on the tag (±2°F), the leak test is positively passed if the difference between the actual pressure and the value recorded on the tag is less than ±10 PSI.

In the event the actual ambient temperature differs from the value recorded on the tag at the time of stretcher storage by more than ±2°F the following correction applies:

$$P_{ACTUAL*} = (P_{STORAGE} \times \frac{T_{ACTUAL} - T_{STORAGE}}{100} \times 0.215 + P_{STORAGE})$$

The following condition must be verified:

$$P_{ACTUAL*} - P_{ACTUAL} \leq \pm 10 \text{ PSI}$$

Where:

$P_{ACTUAL*}$ = Corrected actual pressure (PSIG)

P_{ACTUAL} = Actual pressure reading (PSIG)

$P_{STORAGE}$ = Pressure reading at storage time (PSIG)

T_{ACTUAL} = Actual temperature reading (°F)

$T_{STORAGE}$ = Temperature reading at storage time (°F)

c. If the above condition is not verified a complete system leak detection, as per the following steps procedure, must be performed and the leak source detected and eliminated.

2. LITTER BASE INSTALLED ON BOARD

1) plug the oxygen port located in the base front panel
2) open the oxygen bottle valve
3) check for leakage the fittings and the valve on the oxygen bottle, the refilling valve, the oxygen port located on the front panel. If no bubble appears after one minute the system can be considered acceptable.
   The test may be performed at any pressure inside the bottle; no rechearge at the maximum operating pressure is needed
4) close the oxygen bottle valve
5) read the oxygen pressure on the guage located in the front panel
6) after 5 minutes repeat reading. If no pressure decay is evident the system is considered acceptable. If a pressure decay is evident the leakage check must be extended also to the components and fittings located inside the base. Access to the components can be gained through the base rear panel and removal of the oxygen bottle retaining panel
7) If any leakage is detected tighten the fittings or change the accessory as necessary.

NOTE

MIL-L-25567 approved leak detection solution must be used.

CONFIGURATION B - LifePort Inc. - Piaggio Kit 80KM00008 and
CONFIGURATION C - LifePort Inc. - Piaggio Kit 80KI00017

BLS OXYGEN SYSTEM SERVICE

REFILLING THE SYSTEM

The oxygen system can be serviced through a fill port located under the "OXYGEN FILL PORT ACCESS" placarded door on the front panel of each BLS base.

WARNING

Oil, grease or other lubricants in contact with high pressure oxygen can create an extreme fire hazard. Any such contact must be avoided. Do NOT allow smoking or open flame of any kind near airplane or BLS while working on the oxygen system.

WARNING

Each time a BLS system is to be either connected to or disconnected from the airplane electrical power supply, be sure the battery is OFF before the BLS electrical plug is engaged in/disengaged from the airplane power connector.

1. Remove the BLS from the airplane for refilling the oxygen cylinder.
2. Use Aviators Breathing Oxygen conforming to MIL-O-27210.
3. Check oxygen system high pressure gage.
4. Check the oxygen valve is on.
5. Do not fill the system if fitting or filler valve are corroded, contaminated or damaged. Clean the filler valve, if contaminated, with stabilized trichloroethylene and let air dry. Do not use solvent.
6. If the cylinder is completely empty, do not fill until the entire system has been purged.
7. Connect the filler valve to the external filling equipment.
8. Fill the cylinder following the instructions associated to the filling apparatus.
9. On the bases of ambient temperature fill to the following table pressure.

OXYGEN SERVICING CHART

Ambient Temperature Degrees Fahrenheit	After Cooling Pressure Static PSIG	* Filling Pressure For 2216 PSI At 70 °F PSIG
0	1855	1970
10	1915	2035
20	1960	2060
30	2020	2121
40	2050	2185
50	2110	2245
60	2160	2310
70	2216	2365
80	2275	2395
90	2335	2455
100	2395	2510
110	2435	2570
120	2490	2630
130	2550	2690

* This column assumes 25 °F rise in temperature due to the heat of compression, and it assumes that the cylinders are being filled at their maximum rate.

OXYGEN CYLINDER CAPACITY

The oxygen cylinder capacity with reference to the inside pressure can be read on the following graph.

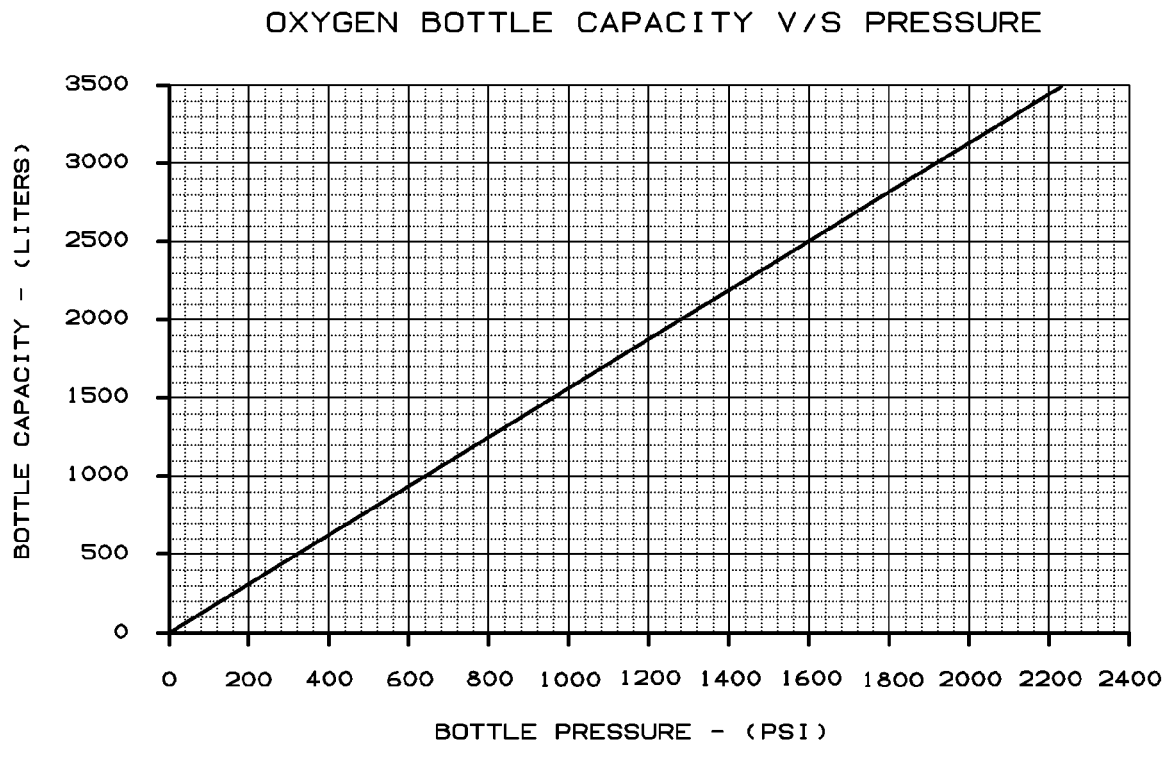

Figure 9-44. OXYGEN BOTTLE CAPACITY vs. PRESSURE at 21°C (70°F) - CONFIGURATION B

CYLINDER TEST

As per the DOT 3AL specification 49CFR, section 173.34, published December 24, 1981, revised May 13, 1982, a 5 (five) year cylinder retest is required.

LEAKAGE TEST

Refer to the same point of "Configuration A - Egan Aviation - Piaggio Kit 80KM00005".

PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 18 FOR THE UNIVERSAL AVIONICS SYSTEMS CORPORATION UNS-1D FLIGHT MANAGEMENT SYSTEM

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Universal Avionics Systems Corp. UNS-1D Flight Management System (Software configuration 701.x or 703.x) is installed on the P.180 airplane standard equipped with Collins avionics systems; among them the UNS-1D is interfaced with the following ones: EFIS-85B4 Pilot's Flight Instruments, ADS-85 Digital Air Data System, VIR-32 Primary VOR/ILS Receiver, DME-42 DME Receiver, MCS-65 Compass System.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and the Approved Airplane Flight Manual.

The UNS-1D is a multisensor area navigation system basically consisting of a cockpit mounted Control Display Unit (CDU), a remote mounted Navigation Computer Unit (NCU, interfaced with the aircraft navigation sensors, EFIS and Autopilot through EFIS), and a Portable Data Transfer Unit (DTU).
The NCU incorporates a TSO C-129 Cat. A1-B1-C1 approved GPS receiver performing a predictive Receiver Autonomous Integrity Monitoring function (RAIM) and other GPS data health monitoring functions to evaluate the expected system accuracy and verify the minimum requirements for the specific phase of flight are met.
Satellite navigation is based upon use of only the Global Positioning System operated by the United States of America.

The installation on the P.180 may also include a Universal Avionics Systems Corp. Radio Reference Sensor (RRS) providing TACAN and additional VOR/DME data.

The UNS-1D, as installed on the P.180, can provide lateral navigation guidance for enroute, terminal and approach operations (both manual and autopilot/flight director coupled) and advisory vertical navigation guidance for enroute operations.
The UNS-1D, as installed on the P.180, is also eligible for approval of both B-RNAV operations in European airspace and NAT-MNPS "ICE GREEN" routes.
In flight maneuvers including pre-defined Search Pattern (Special Missions) are implemented as well.

SECTION 2 – LIMITATIONS

a) OPERATOR'S MANUAL
Prior to flight, whenever navigation is predicated on the use of the UNS-1D, the flight crew must identify the software version (SCN) by CDU readout (on the initialization page) and verify that the applicable Operator's Manual is available for use.
- For SCN 701.x the Universal Avionics Systems Corp. Report No. 2423sv701 dated July 23, 1996 (or later revision) must apply.
- For SCN 703.x the Universal Avionics Systems Corp. Report No. 2423sv703 dated February 16, 1998 (or later revision) must apply.

b) DATA BASE
Check the Data Base expiration date by CDU readout. If the Data Base is expired, IFR navigation is prohibited unless the pilot verifies each waypoint and navaid to be used for accuracy by reference to current approved data.
Navigation Data Base (D/BASE) Limitations:
- The D/BASE must be updated to the latest revision every 28 days. Standard data for updating, based on Jeppesen data base, are provided by Universal Avionics Systems Corp. on a 28 days cycle. Update diskettes will be received by mail to subscribers several days before the effective date of applicability.
- The D/BASE loading/updating shall be performed following the procedures included in the Operator's Manual referenced above by means of the Portable Data Transfer Unit.

c) LATERAL NAVIGATION APPROVALS
The UNS-1D is approved for VFR/IFR enroute, terminal area, RNAV and non precision approach (using the WGS-84 co-ordinate reference datum) operations in accordance with the criteria of FAA AC 20-130A and provided the system is receiving adequate usable signals from approved sensors.
The UNS-1D, as installed on the P.180, is approvable for B-RNAV operations in designated European airspace both in general terms and, due to the advanced features of its internal GPS, for routes predicated on GPS coverage only, if used in conjunction with the Universal Avionics System Corp. Off Line RAIM prediction program (P/N 10751 with SCN 10.x or 11.x or later approved version). The previous statement is in accordance with JAA Leaflet No. 2 Rev. 1, but it does not constitute an operational approval.
The UNS-1D, as installed on the P.180, is approvable for operations in NAT-MNPS "ICE GREEN" published routes when used in conjunction with the Universal Avionics System Corp. Off Line RAIM prediction program (P/N 10751 with SCN 10.x or 11.x or later approved version) which must assure that sufficient GPS integrity will exist for the proposed route of flight. The previous statement is in accordance with the criteria of ENAC/RAI Circular Letter No.48 dated October 23, 1997, but it does not constitute an operational approval.

d) VERTICAL NAVIGATION
Vertical Navigation information (displayed on the pilot's EFIS in enroute and terminal modes) is advisory only and is to be used under the pilot responsibility only when navigation in based on UNS-1D.

e) APPROACH MODE
Instrument approaches must always be accomplished in accordance with approved instrument approach procedures as are retrieved by the UNS-1D Data Base, that must incorporate the current update cycle.
- Accomplishments of ILS, LOC, LOC B/C, LDA, SDF and MLS approaches are not authorized.
- The UNS-1D, as installed on the P.180, is approved for the following approaches: VOR, VOR-DME, RNAV, VFR (Pilot aid only) and, in accordance with the State of operator/ registry (as applicable) Aviation Authority requirements, for GPS and GPS overlay NDB.
- Lateral Flight Director and Autopilot coupled approaches are only approved if the UNS-1D is in the FMS approach mode (which provides the proper HSI display of lateral deviation).
- When using the GPS for approach guidance, the GPS integrity monitoring (RAIM) must be available at the final approach fix (FAF).
- GPS may only be used if the reference coordinate datum is WGS-84.

f) NAVIGATION EQUIPMENT
When using the FMS, the airplane must have other approved navigation equipment installed and operating appropriate to the route of flight.

g) SYSTEM FLAG
Navigation should not be predicated on the use of the FMS when the associated information is flagged (FMS1 red flag on EFIS displays). Following a period (5 minutes or more) of invalid operation (FMS1 flag in view), the FMS position should be verified and updated as required.

h) SYSTEM POSITION
The FMS computed position must be checked for accuracy (reasonableness, by visually sighting ground reference points and/or by using other onboard approved navigation equipment and/or a radar fix) prior to use as means of navigation and under the following conditions:

- Prior to each compulsory reporting point during IFR operation when not under radar surveillance or control.
- At or prior to each enroute waypoint during RNAV (B-RNAV in European airspace) operations along approved RNAV (B-RNAV in European Airspace) routes.
- Prior to requesting off-airway routing, and at hourly intervals thereafter during RNAV (B-RNAV in European Airspace) operations.

During periods of POSITION UNCERTAIN navigation shall not be predicated on the use of the FMS.
Whenever the accuracy check reveals a system error greater than the one stated for each phase of flight (see for limits the Operator's Manual) or following a period of POSITION UNCERTAIN, the FMS position should be updated as required for the specific type of operation, by one among the following methods: visually sighting ground reference points, using a radar fix, using other onboard approved navigation equipment.

i) LATITUDE LIMITS
When operating outside the magnetic compass Variation Area (North of 70° north latitude or South of 60° south latitude) the pilot must manually enter magnetic variation.

j) FUEL DISPLAY
Fuel display parameters, being only related to manually entered data, must be used under the pilot's responsibility and do not replace primary fuel quantity or fuel flow gage for fuel load and range planning.

SECTION 3 – EMERGENCY PROCEDURES

If navigation information from the FMS is intermittent or lost or flagged, use the remaining operational navigation equipment as required (position the CRS selector on EFIS DSP to VOR/ LOC).

System failures or abnormalities are indicated by the "MSG" (message) amber light annunciator on the instrument panel (as well as on EFIS displays) and are spelled out on the CDU CRT display when the MSG key (on the CDU itself) is depressed. Each system message should be noted and appropriate action taken by referring to the applicable Operator's Manual.

If GPS RAIM becames unavailable (as evidenced by the "MSG" and "GPS" remote annunciators):

- do not continue Approach based upon GPS alone;
- continued navigation using GPS position is possible checking position every 15 minutes with another approved navigation system;
- continue either B-RNAV or NAT-MNPS "ICE GREEN" routes navigation based on GPS alone if it is possible to confirm an acceptable level of navigation performance through aiplane position cross-check with other available navigation equipment information. Otherwise revert to an alternative means of navigation.
- apply the instructions contained in the Operator's Manual for the other specific phases of flight.

SECTION 4 – NORMAL PROCEDURES

a) OPERATION

Normal operating procedures are outlined in the applicable Operator's Manual as per Section 2 (a).

b) SYSTEM ANNUNCIATORS

The UNS-1D installation on the P.180 includes two remote annunciator assemblies housed on the pilot's side of the instrument panel (above the EFIS EADI display). The one on the left incorporates the MSG (top), WPT (bottom left) and GPS (bottom right) amber light annunciators. The other incorporates the APPR (top), HDG (bottom left) and XTK (bottom right) amber light annunciators.
The meaning of each annunciator is described below (see also the UNS-1D Operator's Manual for further details):

MSG (message)

The MSG amber annunciator will illuminate and flash in conjunction with the MSG light on the CDU and MSG annunciator on EFIS displays indicating that a new message has become active on the CDU message page(s).

WPT (waypoint alert)

The WPT amber annunciator will illuminate in conjunction with the blinking waypoint alert symbol on EFIS displays, about two minutes prior to the point of a leg change on a navigation leg or about 15 seconds prior to an approach waypoint. This may vary according to ground speed and amount of course change. When the WPT light illuminates, depressing the MSG key on the CDU will display the appropriate message. The light will automatically extinguish when the leg change occurs.

GPS (GPS integrity monitoring)

The GPS amber annunciator is illuminated whenever the integrity of the GPS position cannot be assured to meet the minimum requirements for the particular phase of flight (oceanic, enroute, terminal or approach). Whenever the GPS annunciator is illuminated the pilot should monitor his GPS position by cross reference to other navigation sensors. The GPS must not be used for guidance whenever the GPS annunciator is lit. A list of the pilot's action stobe taken when the GPS annunciator is active, for each particular phase of flight and FMS navigation status, is included in the Operator's Manual.

APPR (FMS approach mode)

The APPR amber annunciator will illuminate in conjunction to the FMS approach annunciator on EFIS displays, whenever the approach mode has been activated on the FMS. When the APPR light is on, the autopilot/flight guidance outputs are referenced to the waypoints on the pilot defined approach. This annunciator will extinguish when the FMS approach mode is cancelled.

HDG (FMS heading mode)

The HDG amber annunciator will illuminate, in conjunction with the FMS heading annunciator on EFIS displays, whenever the heading mode navigation option is selected on FMS. When this light is on, the autopilot/flight guidance outputs are referenced to the heading selected by the pilot on the FMS rather than to the active FROM-TO leg. This annunciator will extinguish as the FMS heading mode is cancelled (either automatically or manually). For additional details see Section 7 of this Supplement.

XTK (selected crosstrack)

The XTK amber annunciator will illuminate when a course parallel to the current navigation leg is selected. The XTK light will extinguish when the parallel course offset is cancelled either manually or automatically at the next leg change.

c) AIRCRAFT INTERFACE

The following procedure supplements the operating instructions in the Operator's Manual.

1) To select the FMS as active navigation source for EFIS and Autopilot/Flight Guidance system, position the CRS selector on EFIS DSP panel to LNAV.

When the LNAV is selected on EFIS DSP (FMS1 annunciated) the information displayed on EFIS include the following:

LATERAL DEVIATION	FMS Crosstrack or Pseudo-LOC deviation. ENROUTE: 7.5 nm full scale APPROACH: angular
TO/FROM	FMS waypoint to/from indication.
FMS1 annunciator/flag	FMS valid/invalid.
FMS1 autopilot annunciator	Autopilot coupled to FMS.
FHDG1 autopilot annunciator	Autopilot coupled FMS heading mode.
COURSE (arrow & display)	FMS desired track as read against the azimuth card.
BEARING POINTER	FMS bearing-to waypoint.
WAYPOINT	Waypoint identifier and location (respect to the aircraft position).
DISTANCE TO WAYPOINT	FMS distance to TO waypoint.
APPR annunciator	FMS approach mode.
VERTICAL DEVIATION	FMS VNAV deviation (500 ft/dot).
WIND SPEED & DIRECTION	FMS computed wind data.
DR annunciator	FMS in Dead Reckoning mode.
MSG annunciator	FMS message.

2) Flight Director operation:

Once the navigation leg or the pseudo VORTAC mode has been selected and FMS1 is annunciated on EFIS, the Flight Director can be coupled by depressing the NAV key on the Autopilot Controller. FMS1 mode annunciation (green) is provided on EFIS top left.
Proper deviation signals are provided by the FMS to the Autopilot/Flight Guidance Computer (through the EFIS processors) to drive the pilot's (and copilot's) ADI command bars (V-bars) in accordance to the selected path.
When the approach mode is activated on the FMS, the V-bars are driven according to the lateral deviation signals generated by the FMS provided that NAV is selected on the Autopilot Controller.

CAUTION

When the approach mode is activated on the FMS, APR must not be selected on the autopilot controller and therefore AP coupled GO-AROUND will not be available.

Vertical guidance during FMS approach is not provided in the P.180 installation.

3) Autopilot operation

Once the navigation leg or the pseudo VORTAC mode has been selected and FMS1 is annunciated on EFIS, the Autopilot can be coupled by depressing the NAV and AP ENG keys on the Autopilot Controller. FMS1 mode (green) is annunciated on EFIS top left in addition to AP (and YD).
Proper deviation signals are provided by the FMS to the Autopilot/Flight Guidance Computer (through the EFIS processors) to drive the pilot's (and copilot's) ADI command bars (V-bars) and control servos in accordance to the selected path.
When the approach mode is activated on the FMS, the V-bars and the control servos are driven according to the lateral deviation signals generated by the FMS provided that NAV is selected on the Autopilot Controller.

CAUTION

When the approach mode is activated on the FMS, APR must not be selected on the autopilot controller and therefore AP coupled GO-AROUND will not be available.

Vertical guidance during FMS approach is not provided in the P.180 installation.

4) VNAV

VNAV mode must be disabled before deselecting LNAV on EFIS DSP.

SECTION 5 – PERFORMANCE

No changes to the basic performances provided by Section 5 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

When the Universal Avionics Systems Corp. UNS-1D Flight Management System and the optional UNS-RRS Radio Reference Sensor are installed the following items must added to the Equipment List at the Section 6 "Weight and Balance" of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-50	DEPENDENT POSITION DETERMINING					
	UNS-1D FLIGHT MANAGEMENT SYSTEM					
	- Navigation Computer (NCU) Universal Avionics Sys. Corp. 1192-30-111101	6.50	–16.50	–1.07	1	
	- Mount, Navigation Computer Universal Avionics Sys. Corp. 80009000	1.20	–16.50	–0.20	1	
	- Control Display Unit (CDU) Universal Avionics Sys. Corp. 1018-1-100	3.80	37.70	1.43	1	
	- GPS Antenna Universal Avionics Sys. Corp. 10704	0.50	158.50	0.80	1	
	UNS-RRS RADIO REFERENCE SENSOR (Optional)					
	- Radio Reference Sensor (RRS) Universal Avionics Sys. Corp. 1058-01-12	8.00	–16.50	–1.32	1	
	- Mount, Radio Reference Sensor Universal Avionics Sys. Corp. 80009000	1.20	–16.50	–0.20	1	
	- RRS Antenna Dorne-Margolin DM NI70-2	0.25	81.00	0.20	1	

SECTION 7 – DESCRIPTION AND OPERATION

The UNS-1D Flight Management System (FMS) basically consists of a Navigation Computer Unit with an internal GPS receiver (NCU), a Configuration Module, a Control Display Unit (CDU), a GPS antenna, the remote annunciators, a Portable Data Transfer Unit (DTU) and an optional Radio Reference Sensor (RRS) with its own antenna.

The Control Display Unit (CDU) is located in the cockpit pedestal and allows the control and monitoring of the system and all the associated sensors.

The Navigation Computer Unit (NCU), located in the nose avionics bay, houses the system's central processing unit, a TSOC-129 approved GPS receiver, the navigation sensors interface circuits, the instruments (EFIS) interface and the navigation Data Base.

In the P.180 installation the NCU receives navigation inputs from the Primary VOR/DME (Collins VIR-32/DME-42), the Primary Compass System (Collins MCS-65), the Digital Air Data System (Collins ADS-85), the optional Radio Reference Sensor (Universal UNS-RRS) and accepts weather radar "joystick" waypoint definition input from EFIS system (Collins EFIS 85-B4 three-tube).
Digital and/or analog outputs, as appropriate, are provided to EFIS, Primary VOR/DME (for tuning), Radio Reference Sensor (for tuning) and to the MSG/WPT/APPR/XTK/HDG remote annunciators located on the pilot side of the instrument panel (see Section 4 of this Supplement).
The configuration data specific to the airplane are written in the Configuration Module non volatile memory at the time of installation.
This module is mounted behind the NCU rack, to allow NCU replacement without requiring the re-initialization.
Configuration data can be accessed through a CDU but their modification is restricted.

The NCU processes (Kalman filtering) the position data received from all available selected sensors (including its internal GPS receiver) and determines the Best Computed Position (BCP).
A sensor "watchdog" feature, also accomplished by NCU, consists of continuously monitoring the difference between each sensor's position assessment and the BCP.
If this difference exceeds a preset value the erratic sensor is automatically deselected to avoid BCP contamination and a proper message is generated to warn the operator.
The GPS portion of the NCU, conforming to the TSO C-129 Class A1, B1, C1, implements a predictive Receiver Autonomous Integrity Monitoring (RAIM) function which supports the use of GPS for enroute, terminal and approach operations.

A strut switch input to the NCU causes all available sensors to be automatically selected as the airplane lifts off and determines their deselection with automatic position hold at touchdown.
Manual selection/deselection of individual sensors is however allowed both on ground and airborne.
The strut switch information is overridden as the true airspeed exceeds 150 Kts.

Based on the BCP, the FMS allows navigation along the pilot programmed flight path which can include Standard Instrument Departure procedures (SIDs), airways, predefined search patterns (Orbit, Rising Ladder, Sector Search, Border Patrol, Race Track, Expanding Square), holding procedures, Standard Terminal Approach Route procedures (STARs), approaches and runways.
The BCP is then used to provide all secondary navigation functions such as course, bearing, desired track, distance, estimated time enroute (ETE), estimated time of arrival (ETA), wind, ground speed, etc..

Using its internal data base the NCU automatically scans all available DMEs by using both the DME-42 blind channels (without any interference with the pilot's controlled DME channels) or the RRS (if installed).
Information from the scanned DME stations are presented both on the CDU DME page and on EFIS (Extended Data). The computed rho-rho position is not used to update any sensor position but tracked separately and blended into the BCP.
Bearing information from VOR is used if only one DME is available or during RNAV approaches.
Tuning of the VOR (VIR-32) and TACAN (RRS, if installed) is also provided by the NCU (directly or via the CDU).

If the CRS selector on the EFIS Display Select Panel is positioned to LNAV, all navigation information from the FMS is displayed on EFIS Electronic HSI (EHSI) and Multifunction Display (MFD). In such condition, deviation signals from the FMS are routed by EFIS processors to the Autopilot computer.
If NAV mode is selected on the Autopilot Controller, this information is then used either to drive the ADIs "V-Bars" (Flight Director Mode, with A/P disengaged) or to generate servo commands for automatic aircraft control (Autopilot Engaged Mode).

The deviation signals generated by the NCU for autopilot/flight director coupled operations are related to the steering limits versus altitude established by the pilot (see Operator's Manual).
The NCU calculates the circular arc to turn on course and provides a wings level rollout with the aircraft heading directly towards the next waypoint.

The FMS heading mode allows the pilot to command the Autopilot/Flight Guidance Computer to fly a selected heading without the need of dropping the A/P NAV mode and selecting the A/P HDG mode.
The selected heading can be entered either via the CDU keyboard or via EFIS DSP heading bug and is displayed on both EFIS (with a special simbol) and CDU. This function can be used both to fly a selected heading and to intercept the current navigation leg or the approach inbound course. In the latter case the FMS HDG is dropped as the leg is intercepted.
During A/P coupled operations the activation of this mode causes FHDG1 autopilot mode annunciation (green) to replace FMS1 (green) on the EFIS EADI.

If the approach mode is activated on the CDU (only within about 50.0 nautical miles from the designated pilot defined end-of-approach point), the FMS, as installed on the P.180, provides lateral deviation signals and APPR annunciation for display on EFIS EADI and EHSI (2D approach), in addition to APPR remote annunciation.
If the NAV mode is selected on the Autopilot Controller too, autopilot/flight director coupled 2D approaches to any runway are allowed.

The FMS provides IFR guidance (2D only in the P.180) for VOR/DME, VOR, TACAN (with RRS), NDB, GPS and GPS overlay NDB approaches, in addition to conventional RNAV approaches, for any published non-precision IFR approach and allows FMS-enhanced VFR approaches as well.

The minimum operational sensors when flying a VOR/DME or RNAV approach are the VOR and DME from the referenced navaid.
Other DME distances and information from other sensors (which meet the accuracy requirements) are used for position cross check and determine the approach mode to be canceled if a navigation accuracy degradation were detected.
For VOR approaches the VOR signals must be received from the referenced navaid as well as DME data from available facilities.
FMS enhanced VFR approaches can be flown using any combination of available sensors (that is the BCP) with no reference navaid required provided the BCP Q factor is lower than 28.
Air data and heading are required for every approach type.

The FMS also provides EFIS processors with vertical navigation (VNAV) information according pilot defined vertical flight path (waypoints altitude and target vertical speed) for display on EADI and EHSI during the enroute phase of flight (vertical deviation scale on the right side of the instruments with cross-shaped pointer).
In the P.180 installation VNAV information is advisory only and cannot be coupled to the autopilot/flight director.
Whenever the FMS approach mode is activated, the FMS VNAV mode is canceled and vertical deviation scale is removed from view.

Fuel Management is provided as a "stand-alone" function based on manual data entering (gross weight, fuel quantity, engines fuel flow, etc.) and display of information on the CDU only.

The NCU contains a non volatile memory (powered by a lithium battery hard soldered to the CPU board of the NCU: being an on condition unit no scheduled maintenance or testing is required. Should a battery degradation occur, a FMC BATT LOW message will be displayed on the FPCDU: in this event the NCU must be serviced at an Universal Avionics System Corp. authorized facility) where is stored the internal data base containing worldwide or regional airports, navaids, airways (high and low altitude), intersections, enroute waypoints, terminal waypoints, SIDs, STARs, approaches and pilot defined data (waypoints, routes, runways, SIDs, STARs and approaches).

The Data Transfer Unit (portable) is a 3.5" floppy disk drive housed within a protective case that can be connected to the system via the connector on the right side of the pedestal (nearby the floor).
DTU functions include periodical updating of Jeppesen Data Base, loading of pilot defined data (such as flight plans and check lists created with a compatible off-line flight planning software on a personal computer), Pilot Data Base saving, loading of airplane specific performance data, data recording.

The GPS antenna is a low-profile type with a built-in pre-amplifier located on the top of the fuselage.

The optional Radio Reference Sensor (RRS), when installed, is located in the nose bay and functions as a multichannel DME/TACAN transceiver and VOR receiver, able to provide DME, VOR and TACAN data simultaneously to the FMS without interfering with the airplane existing radios.
RRS operation is fully controlled by the FMS.
The RRS antenna, installed in the bottom of the fuselage below the entry door, is used for TACAN/DME.
For receiving the VOR signals the RRS shares the existing antenna with the airplane VOR/ILS receivers.

The NCU, the DTU (if plugged in) and the RRS (if installed) are powered by the +28VDC RH Avionics Bus via the LRN-PWR (5A), LRN-DTU (3A) and LRN-SENSOR (3A) circuit breakers respectively (all located on the COPILOT CB PANEL). Power to the CDU is provided by the NCU.
The 400 Hz for reference is supplied (through the 1A LRN fuse) by the 26VAC Primary Bus located inside the AC Control Unit which is mounted in the nose.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook arenecessary for this supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 19 FOR THE BENDIX/KING KHF990 HF COMMUNICATION SYSTEM

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Bendix/King KHF990 HF Radio Communication System is installed.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual

High Frequency radio communications allow reliable long range transmission and reception over distances of thousands of miles. This makes HF radio particularly useful when flying over vast water surfaces or desert land areas where VHF communications, limited to line of sight transmission, are out of reach.

Depending on airplane avionics equipment installation, the electrical power can be supplied to the system either with or without the control through the AVIONICS master switch.

SECTION 2 – LIMITATIONS

No changes to the basic limitations provided by Section 2 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 3 – EMERGENCY PROCEDURES

No changes to the basic emergency procedures provided by Section 3 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 4 – NORMAL PROCEDURES

WARNING

When performing a HF radio check on the ground, make certain that all personnel are clear of the HF probe antenna before transmitting. Serious RF burns can result from direct contact with the antenna when the system is transmitting.

CAUTION

VOR and Localizer indications may be affected during HF COM transmission.

NOTE

ADF, Torque and Engine Oil Pressure indications may be affected during HF COM transmission.

PREFLIGHT CHECK

REAR FUSELAGE

HF probe antenna - CHECK FOR INSTALLATION AND CONDITION

BEFORE ENGINE STARTING

HF communication system - CHECK OFF

CAUTION

Depending on airplane installation, if power to the HF communication system is not delivered through the avionics master switch failure to turn the system OFF before engine start up may result in equipment damage.

BEFORE ENGINE SHUTDOWN

HF communication system - CHECK OFF

CAUTION

Depending on airplane installation, if power to the HF communication system is not delivered through the avionics master switch failure to turn the system OFF before engine shutdown may result in equipment damage.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 6 – WEIGHT AND BALANCE

EQUIPMENT LIST

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the HF communication system is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
23	**COMMUNICATIONS**					
23-10	SPEECH COMMUNICATIONS					
	HF COMM SYSTEM					
	- Transceiver KTR 993 King 063-01007-0000	13.01	335.94	43.70	1	
	- Mounting Kit King 050-02121-0001	1.01	335.94	3.61	1	
	- Control Panel KFS 594 King 071-01274-0002	0.80	16.70	0.13	1	
	- Antenna Coupler KAC 992 King 064-01029-0000	7.80	411.61	32.11	1	
	- Antenna KAC 992 King 071-01272-0001	1.00	464.00	4.64	1	

SECTION 7 – SYSTEM DESCRIPTION AND OPERATION

The KHF 990 HF Radio Communication System consists of a transceiver with its own mounting kit, a control panel, an antenna coupler and a probe antenna.
The transceiver is fastened to the ceiling of the baggage compartment, the control panel is located in the right section of the instrument panel, the antenna coupler is installed at the end of the fuselage tail cone while the probe antenna is installed on the coupler and protrudes from the tail cone.

The integrated, solid-state transceiver incorporates the receiver, the exciter and the power amplifier.
The control panel provides:

– system tuning:

    1. either by directly selecting the desired frequency:
       280,000 operating frequencies at 100 Hz intervals are available in the range from 2.0 to 29.9999 Mhz.
    2. or by recalling the preset and the stored channels:
       19 programmable channels can be preset and stored in a nonvolatile memory. In addition all 176 ITU maritime radiotelephone network (public correspondence) channels are stored in the nonvolatile memory along with the appropriately paired transmit and receive frequencies.

– frequency display
– system monitoring
– channel programming
– operating mode selection:

    1. AM mode (Amplitude Modulation)
    2. A3J and A3A telephone modes:
        a. LSB mode (Lower Side Band) reserved to authorized operators
        b. USB mode (Upper Side Band)

A stud at rear end of the coupler allows an easy and quick installation/removal of the probe antenna.

The system interfaces the audio system providing equivalent operational capabilities on each audio panel by selecting the COM3 position.

Electrical power to the transceiver is derived from the 28 VDC right generator bus through the HF PWR 20-ampere circuit breaker located in the main junction box.

Depending on airplane avionics equipment installation, the electrical power to the HF control panel can be supplied with different kinds of connection:
– from the right generator bus through the only HF CONT 5-ampere circuit breaker, located in the main junction box, and out of the AVIONICS master switch control
– from the right avionics bus through the COMM3 5-ampere circuit breaker, located on the copilot circuit breaker panel, and through the AVIONICS master switch control.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

WARNING

When performing a HF radio check on the ground, make certain that all personnel are clear of the HF probe antenna before transmitting. Serious RF burns can result from direct contact with the antenna when the system is transmitting.

CAUTION

As the HF probe antenna protrudes about 2.54 meters (100 inches) from the tail cone, particular care is to be taken during airplane ground operations (towing, parking, taxiing). A red warning flag installed at the top of the probe antenna is recommended when the airplane is parked and during towing.

ANTENNA INSTALLATION/REMOVAL

The HF probe antenna is screwed on a stud at the end of the antenna coupler for an easy and quick installation/removal.

INSTALLATION

- In order to prevent coupler rotation into its seat, set and firmly hold a wrench at the base of the coupler stud.
- Screw the probe antenna on the coupler stud. Use a wrench for correct tightening.
- Install the safety set screw.

REMOVAL

- Remove the safety set screw.
- In order to prevent coupler rotation into its seat, set and firmly hold a wrench at the base of the coupler stud.
- With the help of a wrench unscrew the probe antenna from the coupler.

PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 20 FOR BALLAST FOR AIRPLANE BALANCING

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when Ballast as per S.B. 80-0058 is installed.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

In order to make easier the airplane balancing for particular cabin arrangements and load configurations the use of removable ballast may be required.

A Ballast Kit is available for installation at the tailcone: a number of Weight/Arm/Moment combinations can be obtained through a set of weights to be arranged, in a variety of amount and positions, on a suitable mounting plate.

Refer to S.B. 80-0058 for ballast mounting plate installation.

SECTION 2 – LIMITATIONS

AUTHORIZED BALLAST

CAUTION

Only the ballast units and related configurations listed at Section 6 of this Supplement are authorized when the suitable mounting plate is installed in the airplane tail cone as per Service Bulletin 80-0058.

CAUTION

When tail ballast is installed as per this Supplement, flight with no or low cabin loads (i.e. ferry fligths) may result critical for C.G. position.
In such condition the pilot should carefully evaluate the needing of removable ballast to be suitably arranged in the cabin.

PLACARDS

In the ballast compartment, stating the maximum allowable ballast weight:

MAX. BALLAST WEIGHT IS 66 LBS (30 KG)

(REFER TO POH SUPPLEMENT No. 20 OR TO S.B. No. 80-0058 FOR BALLAST LOADING)

BALLAST MUST BE POSITIVELY FASTENED

The following placard must be screwed on left side of the pilot instrument panel only when ballast is installed as per this Supplement (remove the placard when ballast is removed):

**BALLAST
IN THE
TAIL**

SECTION 3 – EMERGENCY PROCEDURES

No changes to the basic information provided by Section 3 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

SECTION 4 – NORMAL PROCEDURES

No changes to the basic information provided by Section 4 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

SECTION 5 – PERFORMANCE

No changes to the basic performances provided by Section 5 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when ballast is installed as per this Supplement.

NOTE

The ballast management may vary depending on airworthiness regulations of the Country where the airplane is operated.

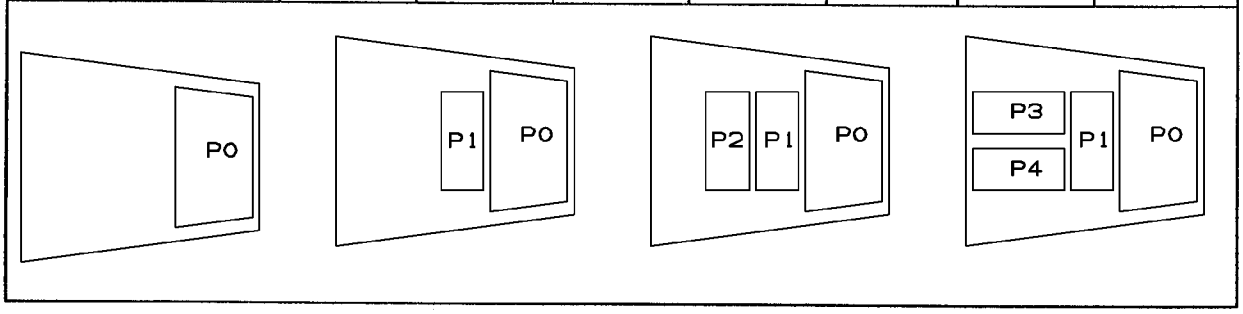
WEIGHT AND BALANCE RECORD

The allovable ballast configurations are listed in the Ballast Configurations Table that follows. For each numbered configuration the ballast units and associated positions are given (refer to sketches in the table).
Each configuration weight, arm and moment includes the ballast only whitout the mounting plate and related hardware to be separately recorded in the "Weight and Balance Record" form.

1. After installing the ballast mounting plate enter the related weight, arm and moment (See the following "Equipment List") in the Weight and Balance Record form at Section 6 of the basic Manual.
   Calculate the new airplane basic weight, arm and moment.
2. Determine the required ballast.
3. From the "Ballast Configurations Table" find the appropriate ballast configuration.
4. Install the ballast units then enter the corresponding ballast configuration weight, arm and moment in the Weight and Balance Record form at Section 6 of the basic Manual.
   Calculate the new airplane basic weight and moment.

BALLAST CONFIGURATIONS TABLE

	POSITION							
	P0	P1	P2	P3	P4			
Config. No.	BALLAST UNIT Dash No.					WEIGHT LBS	ARM IN	MOMENT LBS-IN/100
1	-403	–	–	–	–	17.35	411.65	71.42
2	-403	-007	–	–	–	26.35	410.17	108.08
3	-403	-005	–	–	–	29.85	409.82	122.33
4	-403	-007	-007	–	–	35.45	408.75	144.90
5	-403	-005	-007	–	–	38.95	408.62	159.16
6	-403	-005	-005	–	–	42.45	408.29	173.32
7	-403	-007	–	-007	-007	44.45	407.34	181.06
8	-403	-005	–	-007	-007	47.95	407.34	195.32
9	-403	-007	–	-005	-005	51.45	406.78	209.29
10	-403	-005	–	-005	-005	54.95	406.82	223.55
11	-403	-011	–	-005	-005	58.55	406.85	238.21
12	-403	-005	–	-011	-011	62.15	406.40	252.58
13	-403	-011	–	-011	-011	65.65	406.45	266.83



PIAGGIO AERO

EQUIPMENT LIST

The following items, not included in the weight and balance information presented in Section 6 of the basic Pilot's Operating Handbook, must be considered integral part of the Equipment List as per the ballast configuration installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
53	**FUSELAGE**					
53-80	TAIL CONE					
	BALLAST KIT					
	- Ballast Mounting Plate (complete with hardware) Piaggio 80K561100-401	1.05	406.41	4.27	1	
	- Ballast Unit Piaggio 80K561100-403	17.35	411.65	71.42	1	
	- Ballast Unit Piaggio 80K561100-005	12.53	(*)		1	
	- Ballast Unit Piaggio 80K561100-005	12.53	(*)		1	
	- Ballast Unit Piaggio 80K561100-005	12.53	(*)		1	
	- Ballast Unit Piaggio 80K561100-007	9.03	(*)		1	
	- Ballast Unit Piaggio 80K561100-007	9.03	(*)		1	
	- Ballast Unit Piaggio 80K561100-007	9.03	(*)		1	
	- Ballast Unit Piaggio 80K561100-011	16.10	(*)		1	
	- Ballast Unit Piaggio 80K561100-011	16.10	(*)		1	
	- Ballast Unit Piaggio 80K561100-011	16.10	(*)		1	

(*) Refer to the "Ballast Configuration Table"

SECTION 7 – DESCRIPTION AND OPERATION

The Ballast Kit P/N 80K561100-827 consists of a mounting plate, one 17.3 lbs. (dash -403), three 12.5 lbs. (dash -005), three 9 lbs. (dash -007), and three 16.1 lbs. (dash -011) ballast units.
After the mounting plate has been installed in the tail cone as per S.B. 80-0058, up to four ballast units can be arranged and secured in order to obtain the authorized ballast configurations shown in the Table at Section 6 of this Supplement.
As long as the ballast is kept on board a suitable placard (see Section 2 of this Supplement) must be installed on the pilot instrument panel for crew information.

Ballast installation allows changing the airplane Basic Empty Weight/Arm/Moment to be entered in the "Weight and Balance Loading Form" for C.G. calculation and airplane balancing check. This is useful for the airplanes whose cabin can be rearranged for different kinds of operation.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

BALLAST INSTALLATION/REMOVAL

Access to the ballast mounting plate can be gained by removing the tail panels 320AL and 320AR, the cone fairing 310A and the intermediate fairing (refer to Chapter 6 of the Airplane Maintenance Manual for panel identification).

Refer to the Table at Section 6 of this Supplement for authorized ballast units configurations.
Each ballast unit can be fastened by means of four screws and washers to the anchor nuts provided on the mounting plate at each mounting position.
After tightening the screws check the ballast units are positively fastened.
Install the "BALLAST IN THE TAIL" placard on the left of the pilot instrument panel utilizing one of the panel fastening screws.

After ballast units removal reinstall and tighten the fastening screws and washers on the mounting plate.
Remove the placard from the instrument panel.
Enter weight ,arm and moment of the removed ballast and the new airplane basic weight and moment in the "Weight and Balance Record" form at Section 6 of the basic Manual.

After ballast removal/installation reinstall the previously removed panels and fairings.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 21 FOR CABIN AUDIO PANEL

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Cabin Audio Panel (Kit P/N 80KA00053-801) is installed on the P180 airplane.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The airplane audio system can be upgraded whith the installation of a third audio panel, to be arranged on the cabin sidewall armrest, in order to allow the use of the airplane communication systems from the passenger compartment.

SECTION 2 – LIMITATIONS

No changes to the basic Limitations provided by Section 2 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

SECTION 3 – EMERGENCY PROCEDURES

Should an emergency occur pilot's can stop all VHF communications through the cabin audio panel:

1. VHF FOR CAB AUDIO switch - OFF if necessary

SECTION 4 – NORMAL PROCEDURES

The pilot can either select the VHF communication system available or completely stop VHF communications through the cabin audio panel:

1. VHF FOR CAB AUDIO switch - COM1 or COM2 or OFF as desired

SECTION 5 – PERFORMANCE

No changes to the basic Performances provided by Section 5 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

EQUIPMENT LIST

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the cabin audio panel kit is installed as per this Supplement.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
23	**COMMUNICATIONS**					
23-50	AUDIO					
	CABIN AUDIO PANEL					
	- Audio Panel, cabin Baker B1035-JHMJ-HUJ7	2.00	180.00	3.60	1	
	- Headset, cabin Telex 64300-000	1.00	180.00	1.80	1	
	- Push-to-talk switch, cabin Piaggio 80K198204-401	0.11	180.00	0.20	1	

SECTION 7 – DESCRIPTION AND OPERATION

An optional audio panel can be arranged on the cabin sidewall armrest, as per customer option, providing a third audio position with MIC and phone jacks for headset connection.
No connection to the loudspeakers is provided.
The cabin audio panel allows operations through the interphone, VHF and HF (when installed) communications systems, while no navigation audio signal, no audio alarm signal, and no "page" capability are provided.
For safety reason the use of VHF communication systems from the cabin audio panel can be controlled by the pilot's through the VHF FOR CAB AUDIO 3-position switch located on the copilot instrument panel:

– COM1 position for allowing the use of VHF1 communication system only
– COM2 position for allowing the use of VHF2 communication system only
– OFF position for inhibiting the use of both VHF communication systems

The cabin audio panel is powered by the right avionics bus through the 3-ampere. CABIN AUDIO circuit breaker on the copilot circuit breaker panel.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 22 FOR THE UNIVERSAL AVIONICS SYSTEMS CORPORATION UNS-1K AND UNS-1K MMMS FLIGHT MANAGEMENT SYSTEMS

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Universal Avionics Systems Corp. UNS-1K (Software configuration 603.x) or UNS-1K MMMS (Software configuration 703.x) Flight Management System (FMS) is installed on the P.180 airplane standard equipped with Collins avionics systems; among them the FMS is interfaced with the following ones: EFIS-85B4 Pilot's Flight Instruments, ADS-85 Digital Air Data System, VIR-32 Primary VOR/ILS Receiver, DME-42 DME Receiver, MCS-65 Compass System.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and the Approved Airplane Flight Manual.

The UNS-1K is a multisensor area navigation system basically consisting of a cockpit mounted Flat Panel Control Display Unit (FPCDU), a remote mounted Navigation Computer Unit (NCU, interfaced with the aircraft navigation sensors, EFIS and Autopilot through EFIS), and a Portable Data Transfer Unit (DTU).
The NCU incorporates a TSO C-129a Cat. A1-B1-C1 approved GPS receiver performing a predictive Receiver Autonomous Integrity Monitoring function (RAIM) to evaluate the expected system accuracy and verify the minimum requirements for the specific phase of flight are met.
Satellite navigation is based upon use of only the Global Positioning System operated by the United States of America.

The UNS-1K, as installed on the P.180, can provide lateral navigation guidance for enroute, terminal and approach operations (both manual and autopilot/flight director coupled) and advisory vertical navigation guidance for enroute operations.
The UNS-1K, as installed on the P.180, is also eligible for approval of both B-RNAV operations in European airspace and NAT-MNPS "ICE GREEN" routes.
In the MMMS configuration, in flight maneuvers including pre-defined Search Pattern (Special Missions) are implemented as well.

SECTION 2 – LIMITATIONS

a) OPERATOR'S MANUAL
Prior to flight, whenever navigation is predicated on the use of the UNS-1K, the flight crew must identify the software version (SCN) by FPCDU readout (on the initialization page) and verify that the applicable Operator's Manual is available for use.

- For SCN 603.x the Universal Avionics Systems Corp. Report No. 2423sv603 dated January 30, 1998 (or later revision) must apply.
- For SCN 703.x the Universal Avionics Systems Corp. Report No. 2423sv703 dated February 16, 1998 (or later revision) must apply.

b) DATA BASE
Check the Data Base expiration date by FPCDU readout. If the Data Base is expired, IFR navigation is prohibited unless the pilot verifies each waypoint and navaid to be used for accuracy by reference to current approved data.
Navigation Data Base (D/BASE) Limitations:

- The D/BASE must be updated to the latest revision every 28 days. Standard data for updating, based on Jeppesen data base, are provided by Universal Avionics Systems Corp. on a 28 days cycle. Update diskettes will be received by mail to subscribers several days before the effective date of applicability.
- The D/BASE loading/updating shall be performed following the procedures included in the Operator's Manual referenced above by means of the Portable Data Transfer Unit.

c) LATERAL NAVIGATION
The UNS-1K is approved for VFR/IFR enroute, terminal area, RNAV and non precision approach (using the WGS-84 co-ordinate reference datum) operations in accordance with the criteria of FAA AC 20-130A and provided the system is receiving adequate usable signals from approved sensors.
The UNS-1K, as installed on the P.180, is approvable for B-RNAV operations in designated European airspace both in general terms and, due to the advanced features of its internal GPS, for routes predicated on GPS coverage only, if used in conjunction with the Universal Avionics System Corp. Off Line RAIM prediction program (P/N 10751 with SCN 10.x or 11.x or later approved version). The previous statement is in accordance with JAA Leaflet No. 2 Rev. 1, but it does not constitute an operational approval.
The UNS-1K, as installed on the P.180, is approvable for operations in NAT-MNPS "ICE GREEN" published routes when used in conjunction with the Universal Avionics System Corp. Off Line RAIM prediction program (P/N 10751 with SCN 10.x or 11.x or later approved version) which must assure that sufficient GPS integrity will exist for the proposed route of flight. The previous statement is in accordance with the criteria of ENAC/RAI Circular Letter No.48 dated October 23, 1997, but it does not constitute an operational approval.

d) VERTICAL NAVIGATION
Vertical Navigation information (displayed on the pilot's EFIS in enroute and terminal modes) is advisory only and is to be used under the pilot responsibility only when navigation in based on UNS-1K.

e) APPROACH MODE
Instrument approaches must always be accomplished in accordance with approved instrument approach procedures as are retrieved by the UNS-1K Data Base, that must incorporate the current update cycle.

- Accomplishments of ILS, LOC, LOC B/C, LDA, SDF and MLS approaches are not authorized.
- The UNS-1K, as installed on the P.180, is approved for the following approaches: VOR, VOR-DME, RNAV, VFR (Pilot aid only) and, in accordance with the State of operator/ registry (as applicable) Aviation Authority requirements, for GPS and GPS overlay NDB.
- Lateral Flight Director and Autopilot coupled approaches are only approved if the UNS-1K is in the FMS approach mode (which provides the proper HSI display of lateral deviation).
- When using the GPS for approach guidance, the GPS integrity monitoring (RAIM) must be available at the final approach fix (FAF).
- GPS may only be used if the reference coordinate datum is WGS-84.

f) NAVIGATION EQUIPMENT
When using the FMS, the airplane must have other approved navigation equipment installed and operating appropriate to the route of flight.

g) SYSTEM FLAG
Navigation should not be predicated on the use of the FMS when the associated information is flagged (FMS1 red flag on EFIS displays). Following a period (5 minutes or more) of invalid operation (FMS1 flag in view), the FMS position should be verified and updated as required.

h) SYSTEM POSITION
The FMS computed position must be checked for accuracy (reasonableness, by visually sighting ground reference points and/or by using other onboard approved navigation equipment and/or a radar fix) prior to use as means of navigation and under the following conditions:

- Prior to each compulsory reporting point during IFR operation when not under radar surveillance or control.
- At or prior to each enroute waypoint during RNAV (B-RNAV in European airspace) operations along approved RNAV (B-RNAV in European Airspace) routes.
- Prior to requesting off-airway routing, and at hourly intervals thereafter during RNAV (B-RNAV in European Airspace) operations.

During periods of POSITION UNCERTAIN navigation shall not be predicated on the use of the FMS.
Whenever the accuracy check reveals a system error greater than the one stated for each phase of flight (see for limits the Operator's Manual) or following a period of POSITION UNCERTAIN, the FMS position should be updated as required for the specific type of operation, by one among the following methods: visually sighting ground reference points, using a radar fix, using other onboard approved navigation equipment.

i) LATITUDE LIMITS
When operating outside the magnetic compass Variation Area (North of 70° north latitude or South of 60° south latitude) the pilot must manually enter magnetic variation.

j) FUEL DISPLAY
Fuel display parameters, being only related to manually entered data, must be used under the pilot's responsibility and do not replace primary fuel quantity or fuel flow gage for fuel load and range planning.

SECTION 3 – EMERGENCY PROCEDURES

If navigation information from the FMS is intermittent or lost or flagged, use the remaining operational navigation equipment as required (position the CRS selector on EFIS DSP to VOR/ LOC).

System failures or abnormalities are indicated by the "MSG" (message) amber light annunciator on the instrument panel (as well as on EFIS displays) and are spelled out on the FPCDU CRT display when the MSG key (on the FPCDU itself) is depressed. Each system message should be noted and appropriate action taken by referring to the applicable Operator's Manual.

If GPS RAIM becames unavailable (as evidenced by the "MSG" and "GPS" remote annunciators):

- do not continue Approach based upon GPS alone;
- continued navigation using GPS position is possible checking position every 15 minutes with another approved navigation system;
- continue either B-RNAV or NAT-MNPS "ICE GREEN" routes navigation based on GPS alone if it is possible to confirm an acceptable level of navigation performance through aiplane position cross-check with other available navigation equipment information. Otherwise revert to an alternative means of navigation.
- apply the instructions contained in the Operator's Manual for the other specific phases of flight.

SECTION 4 – NORMAL PROCEDURES

a) OPERATION

Normal operating procedures are outlined in the applicable Operator's Manual as per Section 2 (a).

b) SYSTEM ANNUNCIATORS

The UNS-1K installation on the P.180 includes two remote annunciator assemblies housed on the pilot's side of the instrument panel (above the EFIS EADI display). The one on the left incorporates the MSG (top), WPT (bottom left) and GPS (bottom right) amber light annunciators. The other incorporates the APPR (top), HDG (bottom left) and XTK (bottom right) amber light annunciators.
The meaning of each annunciator is described below (see also the UNS-1K Operator's Manual for further details):

MSG (message)

The MSG amber annunciator will illuminate and flash in conjunction with the MSG light on the FPCDU and MSG annunciator on EFIS displays indicating that a new message has become active on the FPCDU message page(s).

WPT (waypoint alert)

The WPT amber annunciator will illuminate in conjunction with the blinking waypoint alert symbol on EFIS displays, about two minutes prior to the point of a leg change on a navigation leg or about 15 seconds prior to an approach waypoint. This may vary according to ground speed and amount of course change. When the WPT light illuminates, depressing the MSG key on the FPCDU will display the appropriate message. The light will automatically extinguish when the leg change occurs.

GPS (GPS integrity monitoring)

The GPS amber annunciator is illuminated whenever the integrity of the GPS position cannot be assured to meet the minimum requirements for the particular phase of flight (oceanic, enroute, terminal or approach). Whenever the GPS annunciator is illuminated the pilot should monitor his GPS position by cross reference to other navigation sensors. The GPS must not be used for guidance whenever the GPS annunciator is lit. A list of the pilot's action stobe taken when the GPS annunciator is active, for each particular phase of flight and FMS navigation status, is included in the Operator's Manual.

APPR (FMS approach mode)

The APPR amber annunciator will illuminate in conjunction to the FMS approach annunciator on EFIS displays, whenever the approach mode has been activated on the FMS. When the APPR light is on, the autopilot/flight guidance outputs are referenced to the waypoints on the pilot defined approach. This annunciator will extinguish when the FMS approach mode is cancelled.

HDG (FMS heading mode)

The HDG amber annunciator will illuminate, in conjunction with the FMS heading annunciator on EFIS displays, whenever the heading mode navigation option is selected on FMS. When this light is on, the autopilot/flight guidance outputs are referenced to the heading selected by the pilot on the FMS rather than to the active FROM-TO leg. This annunciator will extinguish as the FMS heading mode is cancelled (either automatically or manually). For additional details see Section 7 of this Supplement.

XTK (selected crosstrack)

The XTK amber annunciator will illuminate when a course parallel to the current navigation leg is selected. The XTK light will extinguish when the parallel course offset is cancelled either manually or automatically at the next leg change.

c) AIRCRAFT INTERFACE

The following procedure supplements the operating instructions in the Operator's Manual.

1) To select the FMS as active navigation source for EFIS and Autopilot/Flight Guidance system, position the CRS selector on EFIS DSP panel to LNAV.

When LNAV is selected on EFIS DSP (FMS1 annunciated) the information displayed on EFIS include the following:

LATERAL DEVIATION	FMS Crosstrack or Pseudo-LOC deviation. ENROUTE: 7.5 nm full scale APPROACH: angular
TO/FROM	FMS waypoint to/from indication.
FMS1 annunciator/flag	FMS valid/invalid.
FMS1 autopilot annunciator	Autopilot coupled to FMS.
FHDG1 autopilot annunciator	Autopilot coupled FMS heading mode.
COURSE (arrow & display)	FMS desired track as read against the azimuth card.
BEARING POINTER	FMS bearing-to waypoint.
WAYPOINT	Waypoint identifier and location (respect to the aircraft position).
DISTANCE TO WAYPOINT	FMS distance to TO waypoint.
APPR annunciator	FMS approach mode.
VERTICAL DEVIATION	FMS VNAV deviation (500 ft/dot).
WIND SPEED & DIRECTION	FMS computed wind data.
DR annunciator	FMS in Dead Reckoning mode.
MSG annunciator	FMS message.

2) Flight Director operation:

Once the navigation leg or the pseudo VOR mode has been selected and FMS1 is annunciated on EFIS, the Flight Director can be coupled by depressing the NAV key on the Autopilot Controller. FMS1 mode annunciation (green) is provided on EFIS top left.
Proper deviation signals are provided by the FMS to the Autopilot/Flight Guidance Computer (through the EFIS processors) to drive the pilot's (and copilot's) ADI command bars (V-bars) in accordance to the selected path.
When the approach mode is activated on the FMS, the V-bars are driven according to the lateral deviation signals generated by the FMS provided that NAV is selected on the Autopilot Controller.

CAUTION

When the approach mode is activated on the FMS, APR must not be selected on the autopilot controller and therefore AP coupled GO-AROUND will not be available.

Vertical guidance during FMS approach is not provided in the P.180 installation.

3) Autopilot operation

Once the navigation leg or the pseudo VOR mode has been selected and FMS1 is annunciated on EFIS, the Autopilot can be coupled by depressing the NAV and AP ENG keys on the Autopilot Controller. FMS1 mode (green) is annunciated on EFIS top left in addition to AP (and YD).
Proper deviation signals are provided by the FMS to the Autopilot/Flight Guidance Computer (through the EFIS processors) to drive the pilot's (and copilot's) ADI command bars (V-bars) and control servos in accordance to the selected path.
When the approach mode is activated on the FMS, the V-bars and the control servos are driven according to the lateral deviation signals generated by the FMS provided that NAV is selected on the Autopilot Controller.

CAUTION

When the approach mode is activated on the FMS, APR must not be selected on the autopilot controller and therefore AP coupled GO-AROUND will not be available.

Vertical guidance during FMS approach is not provided in the P.180 installation.

4) VNAV

VNAV mode must be disabled before deselecting LNAV on EFIS DSP.

SECTION 5 – PERFORMANCE

No changes to the basic performances provided by Section 5 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

When the Universal Avionics Systems Corp. UNS-1K Flight Management System is installed, the following items must added to the Equipment List at the Section 6 "Weight and Balance" of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-50	DEPENDENT POSITION DETERMINING					
	UNS-1K FLIGHT MANAGEMENT SYSTEM					
	- Navigation Computer (NCU) Universal Avionics Sys. Corp. 1116-40-1116	6.50	–16.50	–1.07	1	
	- Mount, Navigation Computer Universal Avionics Sys. Corp. 80009000	1.20	–16.50	–0.20	1	
	- Control Display Unit (CDU) Universal Avionics Sys. Corp. 1117-11	2.60	37.70	0.98	1	
	- GPS Antenna Universal Avionics Sys. Corp. 10704	0.50	158.50	0.80	1	
	UNS-1K MMMS FLIGHT MANAGEMENT SYSTEM					
	- Navigation Computer (NCU) Universal Avionics Sys. Corp. 1116-30-1116	6.50	–16.50	–1.07	1	
	- Mount, Navigation Computer Universal Avionics Sys. Corp. 80009000	1.20	–16.50	–0.20	1	
	- Control Display Unit (CDU) Universal Avionics Sys. Corp. 1117-11	2.60	37.70	0.98	1	
	- GPS Antenna Universal Avionics Sys. Corp. 10706	0.50	158.50	0.80	1	

SECTION 7 – DESCRIPTION AND OPERATION

The UNS-1K Flight Management System (FMS) basically consists of a Navigation Computer Unit with an internal GPS receiver (NCU), a Configuration Module, a Flat Panel Control Display Unit (FPCDU), a GPS antenna, the remote annunciators, and a Portable Data Transfer Unit (DTU).

The Control Display Unit (FPCDU) is located in the cockpit pedestal and allows the control and monitoring of the system and all the associated sensors.

The Navigation Computer Unit (NCU), located in the nose avionics bay, houses the system's central processing unit, a TSO C-129a approved GPS receiver, the navigation sensors interface circuits, the instruments (EFIS) interface and the navigation Data Base.

In the P.180 installation the NCU receives navigation inputs from the Primary VOR/DME (Collins VIR-32/DME-42), the Primary Compass System (Collins MCS-65), the Digital Air Data System (Collins ADS-85), and accepts weather radar "joystick" waypoint definition input from EFIS system (Collins EFIS 85-B4 three-tube).
Digital and/or analog outputs, as appropriate, are provided to EFIS, Primary VOR/DME (for tuning) and to the MSG/WPT/APPR/XTK/HDG remote annunciators located on the pilot side of the instrument panel (see Section 4 of this Supplement).

The NCU can also accept navigation information from other compatible sensors (if installed) also allowing (in some cases) remote tuning via the CDU.

The configuration data specific to the airplane are written in the Configuration Module non volatile memory at the time of installation.
This module is mounted behind the NCU rack, to allow NCU replacement without requiring the re-initialization.
Configuration data can be accessed through the FPCDU but their modification is restricted.

The NCU processes (Kalman filtering) the position data received from all available selected sensors (including its internal GPS receiver) and determines the Best Computed Position (BCP).
A sensor "watchdog" feature, also accomplished by NCU, consists of continuously monitoring the difference between each sensor's position assessment and the BCP.
If this difference exceeds a preset value the erratic sensor is automatically deselected to avoid BCP contamination and a proper message is generated to warn the operator.
The GPS portion of the NCU, conforming to the TSO C-129a Class A1, B1, C1, implements a predictive Receiver Autonomous Integrity Monitoring (RAIM) function which supports the use of GPS for enroute, terminal and approach operations.

A strut switch input to the NCU causes all available sensors to be automatically selected as the airplane lifts off and determines their deselection with automatic position hold at touchdown.
Manual selection/deselection of individual sensors is however allowed both on ground and airborne.
The strut switch information is overridden as the true airspeed exceeds 150 Kts.

Based on the BCP, the FMS allows navigation along the pilot programmed flight path which can include Standard Instrument Departure procedures (SIDs), airways, predefined search patterns (Orbit, Rising Ladder, Sector Search, Border Patrol, Race Track, Expanding Square), holding procedures, Standard Terminal Approach Route procedures (STARs), approaches and runways.
The BCP is then used to provide all secondary navigation functions such as course, bearing, desired track, distance, estimated time enroute (ETE), estimated time of arrival (ETA), wind, ground speed, etc..

Using its internal data base the NCU automatically scans all available DMEs by using the DME-42 blind channel (without any interference with the pilot's controlled DME channels).
Information from the scanned DME stations are presented both on the FPCDU DME page and on EFIS (Extended Data). The computed rho-rho position is not used to update any sensor position, but tracked separately and blended into the BCP.
Bearing information from VOR is used if only one DME is available or during RNAV approaches.
Tuning of the VOR (VIR-32) or TACAN (if installed) is also provided by the NCU (directly or via the FPCDU).

If the CRS selector on the EFIS Display Select Panel is positioned to LNAV, all navigation information from the FMS is displayed on EFIS Electronic HSI (EHSI) and Multifunction Display (MFD). In such condition, deviation signals from the FMS are routed by EFIS processors to the Autopilot computer.
If NAV mode is selected on the Autopilot Controller, this information is then used either to drive the ADIs "V-Bars" (Flight Director Mode, with A/P disengaged) or to generate servo commands for automatic aircraft control (Autopilot Engaged Mode).

The deviation signals generated by the NCU for autopilot/flight director coupled operations are related to the steering limits versus altitude established by the pilot (see Operator's Manual).
The NCU calculates the circular arc to turn on course and provides a wings level rollout with the aircraft heading directly towards the next waypoint.

The FMS heading mode allows the pilot to command the Autopilot/Flight Guidance Computer to fly a selected heading without the need of dropping the A/P NAV mode and selecting the A/P HDG mode.
The selected heading can be entered either via the FPCDU keyboard or via EFIS DSP heading bug and is displayed on both EFIS (with a special simbol) and FPCDU. This function can be used both to fly a selected heading and to intercept the current navigation leg or the approach inbound course. In the latter case the FMS HDG is dropped as the leg is intercepted.
During A/P coupled operations the activation of this mode causes FHDG1 autopilot mode annunciation (green) to replace FMS1 (green) on the EFIS EADI.

If the approach mode is activated on the FPCDU (only within about 50.0 nautical miles from the designated pilot defined end-of-approach point), the FMS, as installed on the P.180, provides lateral deviation signals and APPR annunciation for display on EFIS EADI and EHSI (2D approach), in addition to APPR remote annunciation.
If the NAV mode is selected on the Autopilot Controller too, autopilot/flight director coupled 2D approaches to any runway are allowed.

The FMS provides IFR guidance (2D only in the P.180) for VOR/DME, VOR, TACAN (if installed), NDB, GPS and GPS overlay NDB approaches, in addition to conventional RNAV approaches, for any published non-precision IFR approach and allows FMS-enhanced VFR approaches as well.

The minimum operational sensors when flying a VOR/DME or RNAV approach are the VOR and DME from the referenced navaid.
Other DME distances and information from other sensors (which meet the accuracy requirements) are used for position cross check and determine the approach mode to be canceled if a navigation accuracy degradation were detected.
For VOR approaches the VOR signals must be received from the referenced navaid as well as DME data from available facilities.
FMS enhanced VFR approaches can be flown using any combination of available sensors (that is the BCP) with no reference navaid required provided the BCP Q factor is lower than 28.
Air data and heading are required for every approach type.

The FMS also provides EFIS processors with vertical navigation (VNAV) information according pilot defined vertical flight path (waypoints altitude and target vertical speed) for display on EADI and EHSI during the enroute phase of flight (vertical deviation scale on the right side of the instruments with cross-shaped pointer).
In the P.180 installation VNAV information is advisory only and cannot be coupled to the autopilot/flight director.
Whenever the FMS approach mode is activated, the FMS VNAV mode is canceled and vertical deviation scale is removed from view.

Fuel Management is provided as a "stand-alone" function based on manual data entering (gross weight, fuel quantity, engines fuel flow, etc.) and display of information on the FPCDU only.

The NCU contains a non volatile memory (powered by a lithium battery hard soldered to the CPU board of the NCU: being an on condition unit no scheduled maintenance or testing is required. Should a battery degradation occur, a FMC BATT LOW message will be displayed on the FPCDU: in this event the NCU must be serviced at an Universal Avionics System Corp. authorized facility) where is stored the internal data base containing worldwide or regional airports, navaids, airways (high and low altitude), intersections, enroute waypoints, terminal waypoints, SIDs, STARs, approaches and pilot defined data (waypoints, routes, runways, SIDs, STARs and approaches).

The Data Transfer Unit (portable) is a 3.5" floppy disk drive housed within a protective case that can be connected to the system via the connector on the right side of the pedestal (nearby the floor).
DTU functions include periodical updating of Jeppesen Data Base, loading of pilot defined data (such as flight plans and check lists created with a compatible off-line flight planning software on a personal computer), Pilot Data Base saving, loading of airplane specific performance data, data recording.

The GPS antenna is a low-profile type with a built-in pre-amplifier located on the top of the fuselage.

The NCU and the DTU (if plugged in) are powered by the +28VDC RH Avionics Bus via the LRN-PWR (5A) and FPCDU PWR (3A) circuit breakers respectively (all located on the COPILOT CB PANEL). Power to the FPCDU is provided by the NCU.
The 400 Hz for reference is supplied (through the 1A LRN fuse) by the 26VAC Primary Bus located inside the AC Control Unit which is mounted in the nose.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this supplement.

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PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 23 FOR THE UNIVERSAL AVIONICS SYSTEMS CORPORATION CVR-30B COCKPIT VOICE RECORDER

SECTION 1 – GENERAL

This supplement must be attached to the PilotsOperatingHandbook'and Approved Airplane Flight Manual when the Universal Avionics Systems Corporation CVR-30B Cockpit Voice Recorder is installed.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The CVR-30B Cockpit Voice Recorder allows storing up to thirty minutes of cokpit audio and is provided with an Underwater Locator Beacon (ULB).

SECTION 2 – LIMITATIONS

No changes to the basic limitations provided by Section 2 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 3 – EMERGENCY PROCEDURES

No changes to the basic emergency procedures provided by Section 3 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 4 – NORMAL PROCEDURES

POWER UP TEST

When power is initially applied to the CVR, the unit will automatically begin a test. Control Unit indications are:

1. The PASS LED on the Control Unit will illuminate and go out after ten seconds if no CVR fault is detected.
2. A fault condition will illuminate the FAIL LED on the Control Unit and the Signal Level Indicator will activate until a self test is initiated.

NOTE

During certain power up conditions, the FAIL LED may flash momentarily before the power up test completes. This indication may be disregarded.
An actual FAIL condition will cause the FAIL LED to remain illuminated until a self test is initiated.

If the CVR input voltage ever drops below 18 VDC and then rises above 18 VDC at any time, the CVR will repeat the power up test.

Regardless of the Control Unit indications, a preflight self test is necessary.

PREFLIGHT CHECK

Conduct Preflight Self Test as follows:

1. Don headset and plug into the control unit headphone jack.
2. Press the control unit TEST button firmly for at least two seconds and then release. This initiates the CVR Self Test.
3. During self test the PASS and FAIL LEDs will illuminate alternately indicating that self test is in progress. Self test takes approximately 15 seconds to perform. After 10 seconds of self test, cockpit conversation should be heard through the headset and visible on the SIGNAL LEVEL Indicator. The test tone audio will be heard. No audio will be recorded during self test.

NOTE

Self test will not function if Stop Record is initiated. When power is removed and then applied to the CVR, if "STOP RECORD" is active, it will be ignored. "STOP RECORD" must go from an inactive to active condition to be properly recognized. This means that the CVR will immediately start to record upon application of power if "RECORD ON" is ON and "GND EQ INTLK" is OFF, regardless of the condition of "STOP RECORD".

4. Upon completion of a successful self test, the PASS Light will illuminate for approximately ten seconds then go out. A failed self test will be indicated by an illuminated FAIL Light (usually flashing). The flashing FAIL Light indicates the nature of the failure. FAIL will flash a number of times, pause, and then repeat that same number of flashes. The following table shows the fail condition based on the number of FAIL flashes.

Number of FAIL flashes	CVR Condition	FAIL Light	PASS Light
None	Pass	Off	On
1	Channel 1 fail	On	Off
2	Channel 2 fail	On	Off
3	Channel 3 fail	On	Off
4	Channel 4 fail	On	Off
5	Flash Memory Fail	On	Off
Steady (10 secs)	General failure (*)	On	Off
Alternating	System test in progress	Alternating	Alternating
Simultaneous	Bulk Erase (Not activated)	Simultaneous	Simultaneous
(*) General failure is a miscellaneous failure of Ch. 5, 6, FSK, ARINC Channels, etc. The BITE Status code indicates which function has failed. Please contact Univrsal Avionics for assistance with determining a particular BITE Status failure indication.			

5. Should self test fail and it is desired to perform another self test, the TEST Button must be pressed firmly for at least one second to engage self test.

IMPACT SWITCH CHECK

After either a flight in turbulent air or a hard landing the impact switch warning light should be checked: the unit resetting is required if the warning light is illuminated.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 6 – WEIGHT AND BALANCE

EQUIPMENT LIST

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the CVR-30B Cockpit Voice Recorder is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
23	**COMMUNICATIONS**					
23-70	AUDIO MONITORING					
	COCKPIT VOICE RECORDER					
	- CVR-30B Recorder w/ ULB Universal Avionics Sys. Corp. 1603-02-03	13.20	328.50	43.36	1	
	- Installation Kit Universal Avionics Sys. Corp. 1383	1.00	328.50	3.29	1	
	- Control Unit w/ MIC Universal Avionics Sys. Corp. 1633-01	1.10	16.70	0.18	1	
	- Impact Switch Aerodyne Controls Corp. 6895-S-4-X-3-3	1.00	212.00	2.12	1	

SECTION 7 – SYSTEM DESCRIPTION AND OPERATION

The Cockpit Voice Recorder System consists of a recorder unit with attached an underwater locator beacon (ULB), a control panel, and a impact switch.
The recorder unit is installed rearward of the aft baggage compartment and secured to a suitable mount/connector rack. The underwater locator beacon is attached on the front of the recorder unit.
The control panel, with a built in area microphone, is installed forward on the cockpit control pedestal.
The impact switch (g-switch), installed on the fuselage left-side wall in the toilet compartment (near the airplane center of gravity), is provided with an event annunciator light and a reset button.
The g-switch annunciator light is visible through a suitable window on the compartment wall: access to the inspection window can be gained removing the toilet seat back.
Should the event annunciator light illuminate, a g-switch resetting is required. The g-switch reset button can be accessed by removing the seat-back of the (optional) lavatory seat then unscrewing and removing the wall panel below the armrest.
The Cockpit Voice Recorder allows recording all audio signals transmitted or received by the pilot and copilot, as well as cabin page announcements. The cockpit area microphone in the control unit allows to pick up and record cockpit conversations.
The recorder unit is provided with four audio input channels for area microphone, pilot and copilot audio panels and an extra source. All four audio inputs are fed into four 30-minute recording channels.
The control panel provides:

1. a self test function controlled through the TEST pushbutton
2. a HEADPHONE jack for headset connection
3. a SIGNAL LEVEL indicator: indicator segments should illuminate during power up test, auto test and ten minutes after stop-record function has been enabled (through the impact switch), while are not illuminated during normal operations.
4. PASS and FAIL annunciators for system operation monitoring
5. the ERASE function not active in this installation.

The impact switch provides automatic cessation of recording function within 10 minutes after a crash event. The impact switch nominal level setting is 3 g in both fore-aft and left-right directions.
Should the annunciator light come on following an undue engagement of the impact switch, the unit resetting is required by pushing on the reset switch close to the annunciator light.
Electrical power to the system is derived from the 28 VDC essential avionics bus through the CVR 3-ampere circuit breaker, located on the pilot's circuit breaker panel, and controlled by the AVIONICS master switch.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

COCKPIT VOICE RECORDER

Cockpit Voice Recorder Periodic Inspection consists of the required preflight self test. Only if a self test fails, a maintenance check is required on the system.
There is no need of periodic overhaul of the CVR.

PILOT'S OPERATING HANDBOOK AND RAI APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 24 FOR THE NAT NTX138 VHF/FM HIGH BAND COMMUNICATION SYSTEM

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Northern Airborne Technology Ltd. (NAT) NTX138 VHF/FM High Band Communication System is installed.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

VHF/FM High Band provides radio communications in the Marine Band.

SECTION 2 – LIMITATIONS

The NAT NTX138 VHF/FM High Band Communication System installation has been authorized by the ENAC/RAI on the "NO HAZARD" basis; the functionality of the system has not been verified by ENAC/RAI nor any determination has been made that its operation is allowed in any country.
It is owner/operator responsibility to ascertain and/or obtain the system operation authorization from the Airworthiness and Communications Authorities of the country where the airplane is registered or operated.

SECTION 3 – EMERGENCY PROCEDURES

No changes to the basic emergency procedures provided by Section 3 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 4 – NORMAL PROCEDURES

NOTE

Transmission operations on primary or secondary VHF/AM communications systems could occasionally cause VHF/FM-HI receiver squelch opening.
Such abnormal behaviour of the system has been observed in the VHF/FM-HI frequency range from 138 to 142 Mhz.

BEFORE ENGINE STARTING

Before starting engine ensure the system is switched OFF.

BEFORE ENGINE SHUTDOWN

Before shuting down engine ensure the system is switched OFF.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 6 – WEIGHT AND BALANCE

EQUIPMENT LIST

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the VHF/FM High Band communication system is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
23	**COMMUNICATIONS**					
23-10	SPEECH COMMUNICATIONS					
	VHF/FM HI COMM SYSTEM					
	- Transceiver NTX138 NAT Ltd. NTX138-000	5.07	328.50	16.65	1	
	- Mounting Kit NAT Ltd. NTX-IKC	0.45	328.50	1.48	1	
	- Control Panel NAT Ltd. TH250-14JB	2.50	16.70	0.42	1	
	- Antenna Chelton 21-38-4	1.65	157.50	2.60	1	

SECTION 7 – SYSTEM DESCRIPTION AND OPERATION

The VHF/FM High Band Radio Communication System consists of a transceiver with its own mounting kit, a control panel, and an antenna.
The transceiver is installed rearward of the aft baggage compartment and secured to a suitable mount/connector rack.
The control/display panel, is installed on the cockpit control pedestal.
The antenna is located on the fuselage belly.

The transceiver covers a frequency range from 138.000 to 173.9975 Mhz in 2.5 Khz increments.

The control panel provides:

- Up to 128 memorized channels selection.
  Each channel can include a receive frequency, a transmit frequency and an alphanumeric identifier.
- Subaudible tones selction to be associated to each frequency in order to screen unwanted transmissions on shared frequencies.
- Wideband (25 Khz bandwidth) or narrowband (12.5 Khz bandwidth) receiver operation selection.
- A SCAN function to allow scanning of selected channels.
- Either 1 watt or 10 watts transmit power selection.
- Simplex or semi-duplex mode of operation selection.
- Receive or Transmit status indication through a LED that will be green when transmitting and will be amber when receiving. If the radio is not receiving or transmitting the LED remains off.

For further information on the control panel operation refer to applicable manufacturer issued manual.

The system interfaces the airplane audio system providing equivalent operational capabilities on each audio panel by selecting the COM 3 position.

Electrical power to the system is derived from the 28 VDC right avionics bus through the COMM 3 5-ampere circuit breaker located on the copilot circuit breaker panel and is controlled through the AVIONICS master switch control.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic handling, service and maintenance instructions provided by Section 8 of the Pilot's Operating Handbook are necessary for this Supplement.

PILOT'S OPERATING HANDBOOK AND ENAC APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 25 FOR UNPAVED RUNWAYS OPERATIONS

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual for conducting Operations on Unpaved Runways when the required equipment is installed on the airplane.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

Operations on Unpaved Runways are limited to the airfield surfaces defined in Section 2 of this supplement, the information herein contained does not constitute operational approval.
Further limitations could be defined by the Airfield Operators in terms of maximum allowable aircraft weight and maximum allowable tire pressure.

The following tire pressure must be used for comparison to the airfield limitation:

Main landing gear wheel: 119 psi (8.4 Kg/cm2)

The Airfield Operator should provide adequate information of the airfield surface characteristics. For aircraft safe operation, these should be equivalent to a firm soil, or grass surface on firm soil with maximum grass length of 5 cm (2 inches).
The soil is considered firm when there are wheel impressions but no rutting. Maximum wheel impression measured during flight test to demonstrate performance of Section 5 of this supplement, was about 1.5 cm (0.5 inches).
The method used to measure the surface strength expressed as a California Bearing Ratio (CBR), or other accepted runway strength measurement systems, can be used to evaluate the airplane wheel impression depth as a function of the tire pressure.

It must be reminded that surface bearing strength can vary from part to part of an airfield and as a consequence of the environmental conditions.

SECTION 2 – LIMITATIONS

Operations on Unpaved Runways are limited to the following equivalent airfield surfaces:

– firm bare soil;
– grass on firm soil up to 5 cm (2 inches) long.

NOTE

The soil is firm when there are wheel impressions but no rutting.

With reference to landing gear operating life limit, each operating cycle (a takeoff and landing) on an unpaved runway is to be taken in account as four operating cycles on a paved runway.

SECTION 3 – EMERGENCY PROCEDURES

No changes to the basic Emergency Procedures information at Section 3 of the basic Pilot's Operating Handbook are necessary for this supplement.

SECTION 4 – NORMAL PROCEDURES

CAUTION

The level of safety may be decreased when operating on unpaved runways and therefore proper efforts should be made to ensure adequacy of the runway surface for operational use. Pay particular attention that the runway surface should be even i.e. free of ruts, troughs or holes, stones and large vegetation tufts that may decrease performances or damage external equipment and main aerodynamic surfaces.
Wet unpaved runways may be slippery; in such case landing ground run and engine-out stop distance may increase significantly over those indicated in Section 5 of this supplement.

NOTE

When operating on unpaved surfaces dust particles could be suspended in the air, especially with windy weather or following other airplanes operations. In such conditions it could be advisable to deploy anti-ice vanes in order to prevent any engine FOD. In this case performance changes due to ice-vanes deployment, oulined in Section 5 of this POH, are to be added to the performance changes due to the unpaved surface, outlined in Section 5 of this Supplement.

PREFLIGHT CHECK

NOSE SECTION

The gravel protection on the nose gear is to be checked for proper installation and absence of damages.

TAXIING

NOTE

During taxi the required power setting may result in a propeller RPM increase into yellow arc (1300 to 1600 RPM). Prolonged N_P RPM operations in this range should be avoided with a proper use of engine power levers.

Keep the flaps retracted when taxiing to avoid throwing dirtiness (stones, grass, heavy dust or others) in the flap mechanisms and to minimize damages to the flap surfaces, until line-up for takeoff.
Taxi speed should be kept as slow as possible to assure propellers integrity if sand or gravel is present on the airfield surface.
Follow normal procedures for engines run up and checks before takeoff.

TAKEOFF

NOTE

Under particularly slippery conditions the normal procedure for engine ground check may be difficult to be performed.

Operating from an unpaved runway may result in a wheels slipping while holding brakes as per a normal takeoff procedure.
In order to avoid slipping, it is recommended to advance the power levers smoothly while holding brakes up to the maximum power without slipping.
After brake release, advance power levers to the maximum takeoff power as per Fig. 5-17 at Section 5 "Performance" of the basic Pilot's Operating Handbook.
A moderate nose up elevator during takeoff ground run, decreases the load on nose wheels improving the takeoff performance.
If flight condition permits, leave the landing gear extended (without braking the wheels) for a short time after takeoff to remove most of dirtiness (stones, grass, heavy dust or others).
Have a brief operational check of the radio/navigation equipment with the antennas located on the belly of the airplane.

LANDING

NOTE

When operating on unpaved runways the landing procedure must be performed with FLAPS DN.

Prior to reaching 50 ft. above landing surface:
1. Landing Gear - CHECK DN (3 green lights)
2. Flaps - CHECK DN

CAUTION

Steering engagement during landing is prohibited.

3. Approach speed - REFER to Fig. 5-72 at Section 5 of the basic POH
4. Power - AS REQUIRED
5. Condition Levers - CHECK MAX RPM

NOTE

After touch down a moderate nose up elevator must be applied until 60 to 70 KIAS speed has been reached in order to avoid damages to external surfaces and equipment.

CAUTION

Braking is less effective on unpaved runways.

6. Brakes - AS REQUIRED
7. Reverse - Below 1900 N_P, or 5% drop from the set value, slowly retard power levers approximately 3/4 from idle detent into the beta range

CAUTION

Asymmetrical reverse thrust may be difficult to control on a slippery runway.

NOTE

It is recommended to avoid full reverse on landing and to limit beta range or min. reverse only.
When landing at aft C.G. initiate flaps retraction before actuating reverse power.

8. Reverse - AVOID USE below 40 KIAS, approximately

At landing completed:

9. Condition Levers - GROUND IDLE
10. Steering - ENGAGE TAKE OFF (if necessary).

NOTE

During taxi the required power setting may result in a propeller RPM increase into yellow arc (1300 to 1600 RPM). Prolonged N_P RPM operations in this range should be avoided with a proper use of engine power levers.

AFTER SHUTDOWN

Check landing gear, gravel protection kit, wheels, fuselage and wing lower surfaces, fuselage belly antennas and lights, flaps lower surfaces and propellers blades for absence of damages.
After flight if a prolonged stay is forseen or in case of windy conditions full covers on all engines, statics and pitot should be applied in order to prevent FOD.

SECTION 5 – PERFORMANCE

Performance data provided by Section 5 of the basic Pilot's Operating Handbook are to be corrected as follows when operating on unpaved runways:

TAKEOFF AND LANDING DISTANCE ON UNPAVED RUNWAYS

NOTE

All performance data are based on runways as specified in Section 2 of this Supplement. Distance correction factors are based on experimental data of representative surfaces and are for guidance only. Specific runway conditions may result in improved or degraded performance.
The information herein contained does not constitute an operational approval.

TAKEOFF DISTANCE ON UNPAVED RUNWAYS

The Takeoff Ground Run Distance, as per Figure 5-20 on page 5-26 of the basic POH, must be increased by 25% (correction factor = 1.25) for takeoff on unpaved runway.

EXAMPLE:

- Takeoff Ground Run on dry paved runway — 2050 ft (625 m)
- Takeoff Ground Run on unpaved runway — 2050x1.25 = 2563 ft (781 m)

The Takeoff Total Distance, as per Figure 5-19 on page 5-25 of the basic POH, must be increased by 15% (correction factor = 1.15) for takeoff on unpaved runway.

EXAMPLE:

- Takeoff Distance on dry paved runway — 2850 ft (850 m)
- Takeoff Distance on unpaved runway — 2850x1.15 = 3278 ft (999 m)

ACCELERATE AND STOP DISTANCES ON UNPAVED RUNWAYS

The Accelerate and Stop Distance, as per Figure 5-22 on page 5-28 of the basic POH, must be increased by 40% (correction factor = 1.40) when operating on unpaved runway.

EXAMPLE:

- Accelerate and Stop Distance on dry paved runway — 4360 ft (1329 m)
- Accelerate and Stop Distance on unpaved runway — 4360x1.40 = 6104 ft (1861 m)

LANDING DISTANCE ON UNPAVED RUNWAYS

CAUTION

When operating on unpaved runways the Landing procedure is to be performed only with FLAPS DN.

The Landing Ground Run Distance, as per Figure 5-72 on page 5-79 of the basic POH, must be increased as follows when landing on unpaved runway:
- at idle power setting by 60% (correction factor = 1.60)
- at beta range power setting by 20% (correction factor = 1.20)

EXAMPLE:

Landing Ground Run on dry paved runway 1870 ft (570 m)

Landing Ground Run on unpaved runway:
- at idle power setting 1870x1.60 = 2992 ft (912 m)
- at beta range power setting 1870x1.20 = 2244 ft (684 m)

The Total Landing Distance, as per Figure 5-72 on page 5-79 of the basic POH, must be increased as follows when landing on unpaved runway:
- at idle power setting by 40% (correction factor = 1.40)
- at beta range power setting by 12% (correction factor = 1.12)

EXAMPLE:

Total Landing Distance on dry paved runway 2860 ft (872 m)

Total Landing Distance on unpaved runway:
- at idle power setting 2860x1.40 = 4004 ft (1220 m)
- at beta range power setting 2860x1.12 = 3203 ft (976 m)

SECTION 6 – WEIGHT AND BALANCE

EQUIPMENT LIST

The following items, not included in the weight and balance information presented in Section 6 of the basic Pilot's Operating Handbook, must be considered integral part of the Equipment List when the airplane is equipped with the gravel protection for unpaved runways operations.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
32	**LANDING GEAR**					
32-20	NOSE GEAR AND DOORS					
	GRAVEL PROTECTION KIT					
	- Gravel Protection Piaggio 80K174108-801	1.64	– 17.80	– 0.29	1	

SECTION 7 – DESCRIPTION AND OPERATION

The gravel protection kit, consisting of a rubber shield fastend to a suitable support frame, a modified torque link lower pin and a pair of locking bolts washers and nuts, prevents damages to the airplane lower surfaces and equipments.
The gravel protection kit can be installed as follows:

1. Raise the airplane at nose gear and remove the nose gear wheels.
2. Remove the torque link lower pin (Dowty P/N 201031605).

NOTE

This pin must be stored for reinstallation when the gravel protection is removed.

3. Install the gravel protection:
   - engage the forward forks of the protection on the wheel hubs
   - install the modified torque link lower pin (Piaggio P/N 80K174111-001) engaging the protection sustaining holes
   - install the two locking bolts on the forward forks of the protection
4. Reinstall the nose gear wheels.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

When operating on runways not free of ruts, troughs or holes, stones and large tufts, external equipments (antennas and lights, aerodynamic surfaces like wings and flaps, flap mechanism, landing gears and tires) may be damaged.
After each landing on unpaved runways (and each landing following a takeoff from an unpaved runway) additional checks are required.
A complete walk-around check should be performed following the set pattern as per Fig. 4-1 at Section 4 of the basic Pilot's Operating Handbook.
The propeller blades, forward wing, main wing, empennage, control surfaces, antennas, external lights, landing gears, tires and gravel protection kit must be checked for absence of damages.

PILOT'S OPERATING HANDBOOK AND ENAC APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 26 FOR CATEGORY II OPERATIONS

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual for conducting Category II Operations when the required equipment as per Piaggio optional Kits 80KA00007 "Secondary Clock", 80KA00016 "Dual Master Annunciator", 80KA00017 "Turn and Slip Indicator" and 80KA00020 "CAT II" are installed on the airplane.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and approved Airplane Flight Manual, the attached Supplement No. 1 (Collins APS-65 Autopilot and Flight Control System), Supplement No.2 (Collins ADS-85 Air Data System) and Supplement No. 3 (Collins EFIS-85B Electronic Flight Instrument System) only in those areas listed herein for Category II operations.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual and the applicable supplement.

The ENAC approval of this supplement is not an approval to conduct Category II operations. Crew qualifications and equipment mantained per the approved operator's Category II Manual are required for conducting Category II operations.

ABBREVIATIONS

APPR	Approach
CAT II	Category II
DEVN	Deviation
ENR	Enroute
COMP	Composite (Display Format)
COMPTR	Comparator
CWF	Comparator Warning Function
EADI	Electronic Attitude Director Indicator
EHSI	Electronic Horizontal Situation Indicator
GA	Go Around
MFD	Multi Function Display (part of EFIS)

SECTION 2 – LIMITATIONS

1. CAT II approaches are approved only with dual qualified pilot, both engines operating, autopilot coupled and mid or full flaps.
2. The autopilot must be off at and below 100 feet above ground level.
3. All the required instrumentation on the pilot's and copilot's side instrument panel must be serviceable before starting a CAT II approach.
4. Interlock logic of CAT II request enable must be checked during preflight operations.
5. Radio Altimeter test must be performed from pilot's and copilot's seat during preflight operations and in flight before initiating the approach phase.
6. Use of ENR format on pilot's EHSI or MAP format on copilot's EHSI is not permitted.
7. Operation in either EADI COMP or EHSI COMP formats is limited to emergency use only.

NOTE

CAT II operations were demonstrated under the following maximum wind conditions:

- Headwind 6
- Crosswind 11
- Tailwind 11

KIND OF OPERATIONS EQUIPMENT LIST (KOEL)

In addition to the information provided in the Section 2 of the basic POH/AFM KOEL for "IFR Night" and flight into "Known Icing Conditions", the airplane may be operated for Category II Approaches when the following equipment is installed and operable:

System and/or Component	*Number of items installed*	*CAT II Approaches*
Autopilot	1	1
Copilot EHSI	1	1
Copilot ADI	1	1
Pilot EHSI	1	1
Pilot EADI	1	1
MFD	1	1
DPU	1	1
MPU	1	1
DSP	1	1
EFIS Reversionary Panel	1	1
GS Receiver	2	2
LOC Receiver	2	2
Radio Altimeter	1	1
Decision Height Indication	2	2
Marker Beacon	1 (+1 optional)	1
CAT II/CAT II Annunciator-Pushbutton	2	2
COMPTR/EXCESS DEVN Annunciator-Pushbutton	2	2

SECTION 3 – EMERGENCY PROCEDURES

MULFUNCTIONS DURING APPROACH

Should any of the following mulfunctions observed for more than 2 seconds, in the absence of reliable visual references perform a go around/missed approach procedure:

– Loss of power of either engine
– Autopilot disengagement
– Autopilot computer flag in view
– Transition from green CAT II annunciation to amber CAT II annunciation
– Loss of approach mode
– Excess deviation alert
– Comparator alert
– Any air data instrument flag in view
– Navigation flag in view

ENGINE FAILURE DURING AUTOPILOT OPERATION - COUPLED APPROACH/COUPLED GO AROUND

NOTE

Single engine CAT II coupled approaches are not allowed.

1. Control Wheel/Rudder Pedals - HOLD firmly to prevent further deviation
2. MSW Button - DEPRESS
3. Single Engine Go Around - ACCOMPLISH/COMPLETE per Emergency Procedures at Section 3 of the basic POH/AFM
4. Engine Securing Procedure - ACCOMPLISH per Emergency Procedures at Section 3 of the basic POH/AFM
5. Aileron/Rudder Trim - MANUALLY RETRIM
6. Autopilot - RE-ENGAGE
7. Autopilot Modes - RESELECT AS DESIRED

NOTE

Large power changes during single engine operations may require disengaging autopilot and retrimming the airplane prior to resuming autopilot operation.

ENGINE FAILURE DURING AUTOPILOT OPERATION (EXCLUDING COUPLED APPROACH AND GO AROUND)

NOTE

Single engine CAT II coupled approaches are not allowed.

1. Control Wheel/Rudder Pedals - HOLD firmly to prevent further deviation
2. MSW Button - DEPRESS
3. Engine Securing Procedure - ACCOMPLISH per Emergency Procedures at Section 3 of the basic POH/AFM
4. Aileron/Rudder Trim - MANUALLY RETRIM
5. Autopilot - RE-ENGAGE
6. Autopilot Modes - RESELECT AS DESIRED

NOTE

Large power changes during single engine operations may require disengaging autopilot and retrimming the airplane prior to resuming autopilot operation.

SECTION 4 – NORMAL PROCEDURES

AIRSPEEDS FOR NORMAL OPERATIONS

SPEED KIAS Two engines Approach Speed for CAT II operations (V_{REF}):

FLAP MID	
At 10945 lbs (4965 kg) weight	129
At 10270 lbs (4658 kg) weight or below	125
FLAP DN	
At 10945 lbs (4965 kg) weight	125
At 10270 lbs (4658 kg) weight or below	121

NORMAL PROCEDURE CHECKLIST

PREFLIGHT CHECK

1. Annunciator Panel - TEST (GREEN and AMBER CAT II /CAT II and COMPTR/EXCESS DEVN lights ON)

BEFORE TAXI

1. EFIS - TEST
2. Radio Altimeter - TEST and CHECK for proper operation
3. CAT II Interlock Function - CHECK for proper operation

APPROACH AND LANDING PREPARATION

If more than 20 Nm from the ILS station:

1. Autopilot - DISENGAGE (if engaged)
2. Radio Altimeter - TEST (copilot's side) and SET DH
3. Autopilot - ENGAGE
4. Mode selection - HDG
5. Speed - MAINTAIN
6. ILS frequency - SELECT
7. Intercept heading and distance - WITHIN 60 degrees

If 20 Nm or less from the station:

8. Mode selection - APPR
9. Condition levers - 2000 RPM

NOTE

Any erroneous autopilot lateral mode selection other than APPR will not switch off CAT II approach monitoring green light nor will activate the "loss of approach" warning tone.

10. CAT II Checklist - PERFORM
11. CAT II Request - SET (AMBER LIGHT ON)

Prior to Glide Slope capture:

NOTE

Glide Slope must be captured above 1500 ft.

- Autopilot engaged - APPR
- Landing Gear - DWN
- Flap setting - MID
- CAT II Request - CHECK

When between 1 and 1.5 Dot Below Glide Slope:

– Flap Setting - DN (MID if in icing conditions)
– V_{REF} - SET and HOLD

When the Radio Altimeter comes on scale:

– CAT II Annunciator - AMBER LIGHT turns OFF, GREEN LIGHT comes ON

At 1000 feet:

– Approach speed - STABILIZED
– Localizer and Glide Slope - CENTERED
– Altimeters and Radio Altimeters - CROSS CHECKED

From 300 feet and below:

– Approach airspeed - MAINTAIN STABILIZED
– Cockpit procedures to include instrument monitoring - PERFORM
– Call out of any deficiency (see below) and Radio Altimeter read-outs as follows:
300 - 200 - 150 - DH - 50 - 30

At DH (Decision Height Certified for CAT II):

– Decision - LAND or GO AROUND

If Land is decided:

– Autopilot at not less than 100 feet - DISENGAGED

NOTE

Lateral realignment maneuvers are prohibited below 50 feet regardless of existing conditions.

If Go Around is decided:

– GA Push Button - DEPRESS
– Power setting - FULL POWER
– Autopilot - VERIFY LVL and GA GREEN LIGHTS ON
– Aircraft - MONITOR ATTITUDE AND BANK
– Two-engines go around speed - MAINTAIN (120 KIAS minimum)

CAUTION

When operating in icing conditions, the landing procedure must be performed with flaps MID. In this condition the go around speed is 130 KIAS.

– Airplane Configuration - AS REQUIRED

CAT II Deficiencies

The following are excessive deviations from normal and must be called out:
– Airspeed 5 kts above or below the approach speed
– Angle of bank above 15 degrees
– Pitch Attitude below -2 or above +8 degrees
– Rate of Descent in excess of 1000 ft/min
– Excessive Deviation in Localizer and Glideslope
– Any CAT II Instrument System flag in view.

AMPLIFIED NORMAL PROCEDURES

PREFLIGHT CHECK

Refer to Para. 4.3.1 at Section 4 of the basic POH and AFM for the ANN LTS test. During the test check that the green and amber CAT II/CAT II, COMPTR/EXCESS DEVN lights come on, both on the pilot's and copilot's side, in addition to the basic lights on the instrument panel.

BEFORE TAXI

Refer to Supplement 3 at Section 9 of this POH and AFM for EFIS test. Perform the test after a lateral mode has been selected on the Autopilot Annunciator Controller (HDG mode, for instance). Check that the CAT II (amber) and COMPTR (amber) lights come on (both pilot's and copilot's side), together with LOC, GS, RA comparator boxes on EADI and EHSI, in addition to the basic ones. If the requirements for CAT II enable are satisfied while performing the test, the EXC DEVN (amber) and CAT II (green) lights and CWF box on MFDI will come on too.
In the second phase of the test, while all flags are brought into view, check the appearance of the FD red box on EADI, of the COMPUTER flag on ADI (copilot's side) and simultaneously the loss of approach aural warning tone. The tone can be stopped by removing the lateral mode selection.
Test the Radio Altimeter from both pilot's and copilot's station, as follows:

- Pilot's side: depress the "TST" button on the EFIS DSP control panel. The EADI displays the radio altitude generated by the radio altimeter when in self-test (50 ft). "DH" annunciation is displayed on the EADI and the decision height warning light comes on the ADI if the DH set value is greater than the test altitude. On the copilot's DRI-55 panel the 50 ft altitude is displayed too.
- Copilot's side. Depress and hold the "PUSH TEST" knob in the DRI-55. The following sequence is started:
  1. The decision height is shown in the "RAD ALT" display window for 2 seconds.
  2. The system test altitude (50 ft) is displayed for 2 seconds.
  3. Lamp test is displayed until the knob is released.

Refer to Supplement 1 at Section 9 of this POH and AFM for Autopilot test. When the test is completed and before disengaging the autopilot, set the XSIDE ATT and the XSIDE HDG switches on the EFIS panel to the NORM postition, the ADI V-bars switch to the IN VIEW position, the copilot HSI in direct course.
Select CAT II and check that CAT II amber lights turn on and the white CWF readout appears on the Multifunction Display. Starting with this condition check that:

- When the ADI V-bars switch is set to the OUT OF WIEW position, the CWF readout disappears from the Multifunction Display, and appears again when the V-bars IN VIEW condition is restored.
- When the ATT/HDG switches are (alternately) set to the XSIDE position the CWF readout disappears from the Mutifunction Display, and appears again when the NORM condition is restored.
- When the copilot HSI is set to back course the CWF readout disappears from the Multifunction Display, and appears again when the direct course condition is restored.

APPROACH AND LANDING PREPARATION

Refer to ILS Approaches at Section 9, Supplement 1 (Sect. 4) of the POH and AFM.

If more than 20 Nm from the ILS station:

Set the DH (both on the EFIS control panel and on the copilot's radio altimeter dedicated display) and Test the Radio Altimeter not earlier than 5 min. before initiating the approach phase. The test will be performed on the copilot's station as previously described in "BEFORE TAXI". As the test feature is inhibited while the autopilot is engaged, disengaging the autopilot is required before starting the test. The Autopilot can be momentarily disengaged by depressing and holding the AP SYNC button on the control wheel, or, if preferred, by pressing the MSW button on the control wheel. After the Radio Altimeter test has been completed, reengage the Autiplot by pushing the AP ENG switch on the Autopilot control panel or releasing the AP SYNC.

If 20 Nm or less from the ILS station:

After the APPR Mode has been selected and the condition levers adjusted to obtain 2000 RPM, perform the following CAT II checklist:

– Pilot's EHSI	NOT in BACK COURSE
– Copilot's EHSI	NOT in BACK COURSE
– ADI V-bars	IN VIEW
– Cross-side ATT/HDG	NORM position
– VOR/LOC	Selected as DSP active course

NOTE

Any erroneus autopilot lateral mode selection other than APPR will not switch off CAT II approach monitoring green light nor will activate the "loss of approach" warning tone.

Perform CAT II request by pushing the CAT II pushbutton/annunciators on either the pilot's or copilot's side: the checklist starts verifying that the system is properly configured. One of the conditions to be met is Radio Altimeter on scale. The Radio Altimeter is set to operate up to 2500 ft: if the airplane is flying above 2500 ft, the CAT II annunciator, when pushed, will be in the AMBER condition. Check the CAT II AMBER light comes off and the GREEN light comes on, when the airplane reaches an altitude equal to or below 2500 ft.

NOTE

Glide Slope must be captured above 1500 ft.

From 300 feet and below:

Maintain established approach airspeed and monitor instruments until the airplane touches down.
Call out Radio Altimeter read-outs as follows.

300 - 200 - 150- DH - 50 - 30

When the airplane reaches the decision height, a yellow "DH" inscription appears approximately in the center of the pilot's EADI and a dedicated lamp lights up on the copilot's ADI.
Decide if landing the airplane or performing a go around.
If the decision to land has been taken, disengage the Autopilot at an altitude not less than the DH (100 ft) and manually land the airplane.

If Go Around is decided:

In go around situation, press the GA button on the left power lever while increasing power to the bulked landing climb power setting (Refer to Supplement 1 at Section 9 of this POH/AFM for further information on autopilot go around). Maintain torque and engine temperature within allowable limits.
Maintain an aispeed of 120 KIAS (minimum).

CAUTION

When operating in icing conditions, the landing procedure must be performed with flaps MID. In this condition the go around speed is 130 KIAS.

For more information about airplane operation in icing conditions refer to Para. 4.3.23 at Section 4 of the basic POH/AFM.
After climb is established, accelerate the airplane than retract the flap to MID (below 150 KIAS), retract the landing gear, then retract the flap to UP (below 170 KIAS). Accelerate to and maintain a speed of 160 KIAS.

SECTION 5 – PERFORMANCE

Performance data provided by Section 5 of the basic Pilot's Operating Handbook are to be corrected as follows when CAT II appraches are conducted:

- For Landing Weight in Single Engine Go Around refer to Fig. 9-45 on page 9-293 of this Supplement.
- Landing Distance With Flap Down and Without Propeller Reversing, as per Fig. 5-72 on page 5-79, must be increased by approximately 7.2%
- Landing Distance With Flap Down and With Propeller Reversing, as per Fig. 5-73 on page 5-80, must be increased by approximately 8.5%

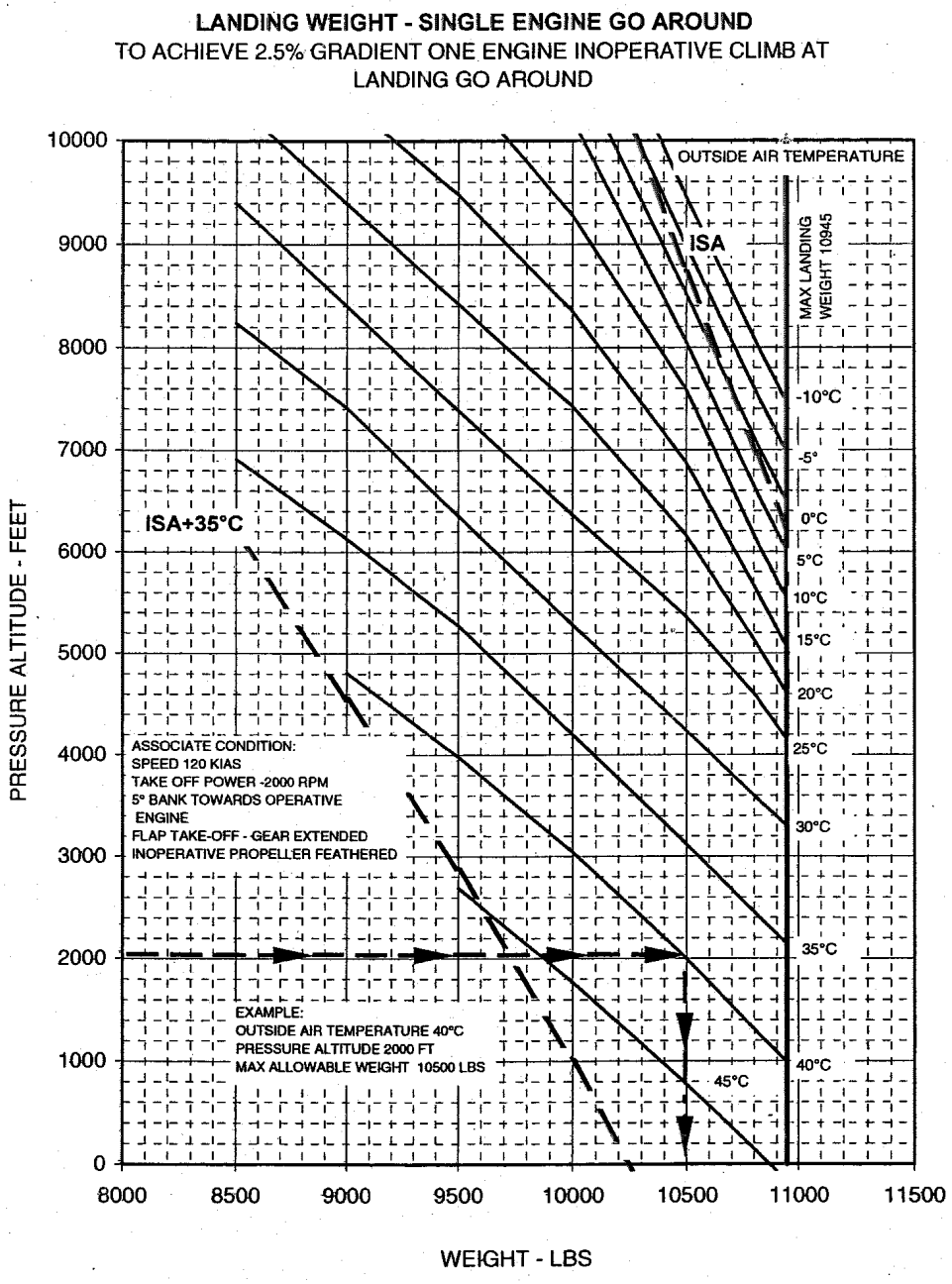

Figure 9-45. LANDING WEIGHT - SINGLE ENGINE GO AROUND

SECTION 6 – WEIGHT AND BALANCE

EQUIPMENT LIST

The following items, not included in the weight and balance information presented in Section 6 of the basic Pilot's and Operating Handbook, must be considered integral part of the Equipment List when the airplane is equipped for CAT II operations.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-50	DEPENDENT POSITION DETERMINING					
	CATEGORY II KIT EQUIPMENT					
	- Annunciator Coupler Piaggio 80K118440-401	0.41	- 17.84	- 0.07	1	
	- COMPTR/EXCESS DEVN Annunciator	0.05	16.00	0.01	2	
	- CAT II/CAT II Annunciator	0.05	16.00	0.01	2	

SECTION 7 – DESCRIPTION AND OPERATION

The following equipment is required to be installed on the airplane for operating under CAT II limits during dual engine/autopilot coupled approaches:

- Autopilot/Flight Director
- Attitude System
- Heading System
- Air Data System
- Electronic Flight Instrument System
- Radio Altimeter System
- VHF Navigation System
- VHF Communication System
- CAT II Control/Monitoring System

AUTOPILOT/FLIGHT DIRECTOR SYSTEM

Refer to Supplement No. 1 at Section 9 of this POH for a complete description of the system.

The autopilot operation during CAT II approaches is still based upon standard approach mode but a higher level of monitoring is activated inside the EFIS multifunction display processor to achieve additional warning functions prescribed when CAT II operation is flown.

ATTITUDE SYSTEM

The airplane is equipped with a dual gyroscopic attitude system (primary and secondary), a standby gyro horizon (pilot's side) and a turn and bank indicator (copilot's side).
Each primary and secondary attitude system consists of a vertical gyro powered at 115 Vac 400 Hz respectively by primary and secondary inverter.
The primary system is interfaced to EFIS, autopilot and weather radar while the secondary provides pitch and roll synchro outputs to elctromechanical copilot ADI.
Due to EFIS cross-side source selection capability the pilot can restore the attitude information on EADI following a failure in the primary system.
In such condition the autopilot disengages and prevents CAT II operation initiation or follow-up.
In order to enhance the reliability of the attitude information a third standby horizon, provided with an own emergency power unit and a turn and bank indicator are installed on the instrument panel for emergency operation under IFR conditions.

HEADING SYSTEM

The airplane is equipped with a dual gyroscopic heading system (Collins MCS-65) and a magnetic compass indicator for emergency operation.
Each primary and secondary heading system consists of a directional gyro slaved to a flux detector and compensated by a remote compensator panel.
The primary compass is powered by DC Essential Avionics Bus being the 26 Vac reference provided by the primary inverter. Primary heading information is sent to EFIS to be displayed on EHSI and to copilot's RMI.
The secondary compass is powered by DC Right Avionics Bus with AC reference from the secondary inverter. Secondary heading information is sent to copilot's electronic flight display (EFD) and to pilot's RMI.

Should the primary system fail the pilot can restore the compass information on EHSI by selecting the cross-side source.
In such condition CAT II approach cannot be initiated and should be discontinued unless visual references were already obtained.

AIR DATA SYSTEM

The aiplane is equipped with a digital air data system as primary source of information and a set of conventional instruments on copilot's instrument panel as secondary indication.
The Collins ADS-85 digital air data system is based on an air data computer, an encoding altimeter, an altitude preselector/alerter, an airspeed indicator and a vertical speed indicator.
The air data computer, linked to the primary Pitot/Static system, converts air data pressures to electronic format and drives the electromechanical indicators installed on pilot's instrument panel. The same air data information is also provided to EFIS for partial display and to the autopilot computer to be used for vertical modes calculations. Refer to Supplements No. 1, 2 and 3 at Section 9 of this Pilot's Operating Handbook for further information.
Copilot's conventional instrumentation is fed from the secondary Pitot/Static system, completely independent from the primary one. This set of indicators does not require electrical supply (except for internal lighting) and may be used under emergency condition.
CAT II operation can be requested only when both air data systems exhibit good performances.

ELECTRONIC FLIGHT INSTRUMENT SYSTEM

A three tube EFIS is installed in the pilot's instrument panel while an EHSI is part of the basic installation on the copilot's instrument panel.
Both systems are adequately covered in the Supplements No. 1 and 3 at Section 9 of the Pilot's Operating Handbook.
Under CAT II operations no further detail is needed for the Collins EHSI-74 copilot's system, whilst an essential role is played by the Collins EFIS-85B (4) pilot's system.
Selection of CAT II request, made by either pilot or copilot when depressing the appropriate switch on the CAT II indicator associated with the respective avionics equipment, will enable the dual independent circuitry for comparator and excessive deviation functions allowing an accurate monitoring of essential parameters during the approach. Comparator/warning functions are provided by the MFD Processor Unit (MPU) and by the Display Processor Unit (DPU).
The DPU compares the deviation data from localizer and glideslope against the calculated data from the MPU using the right side of the ILS sensors. Should the established limits be exceeded, a comparator warning is displayed both on the EADI and EHSI.
The MPU compares the localizer and glideslope deviation data received from left and right VHF navigation receivers. Should a miscompare be detected, the pilot's and copilot's ILS comparator annunciators will illuminate.
The excessive deviation alert function does not require cross-cockpit information.
When the localizer or glideslope deviation data received by the DPU from the left VHF navigation receiver exceed certain limits, the excessive daviation alert is displayed on the EHSI and EADI.
The left and right side of the MPU receive ILS data from, respectively, the left and the right VHF navigation receiver. If either side detects excessive localizer or glideslope deviation, the pilot's and copilot's excessive deviation annunciators will illuminate.

RADIO ALTIMETER SYSTEM

During the approach, a radio altimeter system with an operating limit or 2500 ft provides altitude data to the crew and FCS. The system comprises a transceiver, two antennas and an indicator/control unit on the copilot's instrument panel (refer to Para. 7.26 at Section 7 of this POH).
Through the interconnection of the radio altimeter with the EFIS system, the pilot is provided, on the EADI display, with the radio altitude and with the preset decision height. The above data are displayed in the right bottom corner of the EADI. When the airplane reaches the decision height, a yellow "DH" readout appears approximately in the center of the display.
The pilot can set the decision height value by rotating the related knob on the EFIS control panel.
A dedicated indicator, on the copilot's instrument panel, provides displaying of the current altitude and decision height as well as the setting of decision height value.
When the airplane reaches the decision height, a dedicated light on the copilot's ADI comes on.

VHF NAVIGATION SYSTEM

Refer to Para. 7.26 at Section 7 of this POH.

VHF COMMUNICATION SYSTEM

Refer to Para. 7.26 at Section 7 of this POH.

CAT II CONTROL/MONITORING SYSTEM

The CAT II control/monitoring functions allow checking of the CAT II system proper operation and warning the crew about occurring failure or incorrect operating modes. The CAT II approach request is actuated by pushing the CAT II button on either pilot's or copilot's instrument panel. At CAT II request starting the below listed conditions are checked:

DEVICE	CONDITION
Autopilot	Engaged
EHSI HPU (copilot)	NOT in BACK COURSE
ADI V-bars (copilot)	IN VIEW
Cross-side ATT/HDG switch	NORM position

If any of the above conditions is not checked, both the amber CAT II lights (pilot and copilot side) come on and the CAT II operating mode is not accepted.
If all the conditions are met, the "CWF" (Comparator Warning Function) white box appears on the lower right corner of the MFD, confirming that the Comparator Warning Function has been enabled, and the MPU will perform the following checklist:

DEVICE/FUNCTION	CONDITION
Cross-side Data	Valid
Localizer	Tuned and Valid
Glideslope	Valid
EHSI Back Course (pilot)	Not selected
Radio Altimeter	Valid and on Scale
Attitude	Valid
Heading	Valid
Onside VOR/LOC	Selected as DSP Active Course
DSP	Valid
Go around	Not selected

The positive checking of the above list conditions makes the CAT II green lights illuminating on each pilot instrument panel. If the checklist is not met, the CAT II amber lights come on while the green ones remain off.
The illuminated CAT II green lights assure that the cockpit is properly configured so that at 1000 ft altitude the ILS comparator will be activated and operating, and that between the 600 and 100 ft altitude the excessive deviation monitors will be operating
If the green light comes off when above the decision height, a re-light is possible if the event causing the amber/caution condition has been removed.
If the green light comes off when below the decision height, no re-light is possible until the airplane is below the DH: a go around will be normally performed.
The comparator warnings come on when the comparing function detects a difference between two homogeneous data, delivered by similar systems and exceeding a preset threshold limit.

The comparing function provided by the EFIS DPU and MPU allows monitoring the data consistency from the following systems:

1. Primary and secondary ILS.
2. Primary and secondary Attitude indicating.
3. Primary and secondary Gyroscopic Direction Indicating.

A comparator warning is annunciated through an amber box appearing on the EFIS displays, by the illumination of the EFIS MASTER RESET switch on the pilot's side and of the dedicated amber COMPTR lights at each pilot's station. The comparator warning can be reset either by pushing one of the COMPTR lights, acting also as comparator reset switch, or by pushing the EFIS MASTER RESET switch on the EFIS panel. In the first way the EFIS MASTER RESET light is not reset: if the compare error condition is no longer present, the EADI and EHSI comparator warning annunciators and the COMPTR lights remain off. In the second way all the comparator warning annunciators (COMPTR lights, EFIS MASTER RESET lights and related boxes on EFIS displays) are reset: if the compare error condition is no longer present all annunciators remain off.
If the compare error condition is still present, all the reset comparator warning annunciator come on again, while the Master Warning Switch remains off.
The ILS comparator function is a typical CAT II operation feature and is active below 1000 ft when CAT II request has been made and accepted.
The excessive deviation warnings are annunciated when the airplane track respect to the descent path during the approach phase is found out of the present deviation limit. An excessive deviation warning is annunciated on the EFIS displays by the the ILS pointers, turning to amber and flashing, and by the coming on of dedicated amber EXC DEVN lights at each pilot's station.
It is a typical CAT II operation feature and is active between 100 and 600 ft when CAT II request has been made.
The visual annunciators of a flight director failure warning are associated with the aural warning "loss of approach": the tone frequency ranges from 2100 to 2800 Hz with repetition periods of 0.3 seconds. The priority of the "loss of approach" warning is set just following the stall warning and overspeed warning. After the activation, produced by the "FD" flag on the EADI and the appearance of the COMPUTER flag on the copilot's ADI, the interruption can be provided by:

– Deselection of CAT II request.
– Selection of "Go-Around" mode.
– Deselection of "Approach" mode.
– Autopilot disengagement.

In the last case, the interruption of the aural warning "loss of approach" is followed by the basic "AP DIS" tone.
If affected by the failure, the autopilot automatically disengages. In this event, the aural warning "loss of approach" is not activated: the only "AP DIS" aural tone is provided to the crew.

NOTE

The "loss of approach" warning tone is active only when the autopilot is engaged and the approach guidance system is in CAT II mode.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic handling, service and maintenance instructions provided by Section 8 of the Pilot's Operating Handbook are necessary for this Supplement.

PILOT'S OPERATING HANDBOOK AND ENAC APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 27 FOR RVSM PROVISION

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the RVSM (Reduced Vertical Separation Minima) Provision Optional Kit 80KA00071 is installed, or when the Piaggio Service Bulletin SB-80-0161 has been introduced, on the airplane.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The information provided in this supplement is relative to the RVSM hardware provision only and not to RVSM operations.

NOTE

From the functional point of view, the RVSM Provision System has no operating modes different from the normal display of altitude data to the crew.

ABBREVIATIONS

ADDU	Air Data Display Unit
BAT	Battery
CB	Circuit Breaker
EPB	Emergency Power Bus
EPU	Emergency Power Unit
LCD	Liquid Crystal Display
PWR	Power
RVSM	Reduced Vertical Separation Minima
SSEC	Static Source Error Correction
STBY	Standby

SECTION 2 – LIMITATIONS

No RVSM Operations are authorized when the Provision Kit P/N 80KA00071 is installed, or when the Piaggio Service Bulletin SB-80-0161 is embodied on airplane, until the complete RVSM equipment installation is performed as per Piaggio Service Bulletin SB-80-0162.

SECTION 3 – EMERGENCY PROCEDURES

No changes to the basic emergency procedures provided by Section 3 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 4 – NORMAL PROCEDURES

NORMAL PROCEDURE CHECKLIST

PREFLIGHT CHECK

a) Battery Switch - BAT
b) Avionics Switch - ON
c) ADDU configuration & LCD display - TEST

AMPLIFIED NORMAL PROCEDURES

PREFLIGHT CHECK

During the preflight check the pilot should perform all of the checks listed herein, in addition to the ADS-85 System "Preflight Checks" listed in Supplement 2, Page 9-39, of the Pilot's Operating Handbook.
The pilot should verify that the Battery switch is set to BAT position and Avionics switch is set to ON position.

Select on SYS TEST panel the ADC position, press the test button and hold. Verify that in addition to the basic test performed on the primary Air Data System, the following sequence is displayed on the ADDU:

- the ALT annunciator illuminates;
- the codes **A105** and **2nO** are displayed for approximately 3 seconds;
- blank display for approximately 1 second;
- in the LCD field all the active elements illuminate until the test button is released.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 6 – WEIGHT AND BALANCE

EQUIPMENT LIST

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the RVSM Provision Kit is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-10	FLIGHT ENVIRONMENT DATA					
	RVSM PROVISION KIT EQUIPMENT					
	- Air Data Display Unit ADDU (1) IS&S 9D-80130-32	3.00	15.10	0.45	1	
	- Altimetry 2 Switching Device Piaggio 80K118706-401	0.62	5.71	0.04	1	
	- Altimetry 2 Pushbutton IPP/Staco Switch 631421-029	0.07	16.00	0.01	2	
	(1) With software release 7H-7, Mod. A and tag "P180 LIGHTING" attached to the equipment case.					

SECTION 7 – DESCRIPTION AND OPERATION

The RVSM Provision kit consists of the following equipment:

– Air Data Display Unit (ADDU);
– Altimetry 2 Switching Device;
– Altimetry 2 Pushbuttons.

The ADDU and the two Altimetry 2 Pushbuttons are installed on the instrument panel: the ADDU is on copilot side, while the two pushbuttons are one on pilot's side and the other on copilot's side.
The Altimetry 2 Switching Device is installed in the pressurized compartment, behind the instrument panel.

AIR DATA DISPLAY UNIT

The Air Data Display Unit is a digital encoding altimeter, with data processing capabilities and Preselector/Alerter function.
In the RVSM Provision Sytem, however, the ADDU is used as a normal altimeter, providing altitude data only to the crew, and with the Preselector/Alerter function not enabled.

The ADDU display layout is provided in Figure 9-46. The display is composed of an LCD field and of a dial.
The LCD has two main levels of backlight intensity: the "daytime" intensity (full bright) and the "nightime" one (lower than the previous). The ADDU itself decides which level to select, by sensing whether the +5 V circuitry for the dial illumination lamps is powered, by the A/C instruments lighting system, or not.

In the LCD field the complete altitude data are displayed, together with the baro setting and the active amber warning boxes:

– PWR box: notifies that the ADDU is powered by the back-up power input only;
– STDBY box: notifies that the ADDU is not properly operating.

The baro setting capability is provided by turning clockwise or counter clockwise the BARO knob on the instrument bezel. By pushing the knob for more than 4 seconds, the measurement units of the baro setting are changed from hPa (or inHg) to inHg (or hPa). If the knob is pressed for less than 2 seconds, the default baro setting is displayed (1013 hPa or 29.92 inHg).

The ALT knob on the bezel and the related section in the LCD field are not active, due to the fact that the Preselector/Alerter function is inhibited. The ALT lamp is accordingly non functioning, except during the system and equipment test.

The TEST switch in the ADDU bezel is used for maintenance purpose only.

During the ADC "preflight check" test, in the LCD field appears the information about the way the ADDU has been installed on the A/C. In the case of RVSM Provision, the following codes are displayed:

– "A105" is a default inscription which informs that the ADDU is not connected to the Autopilot System;

– "2nO" informs that the ADDU has been installed on the copilot's side and that no Static Source Error Correction (SSEC) is applied.

The ADDU is provided with two electrical power inputs:

– a primary input, supplied by the Essential Avionics Bus, through the ADDU CB on pilot's CB panel;
– a secondary input, supplied by the Emergency Power Bus (EPB), through the ADDU EMER CB on pilot's CB panel.
  The EPB is an additional bus electrically connected, in normal conditions, to the Left Single Feed Bus and supplied with electrical power by the EPU in electrical emergency conditions.

For this reason the ADDU is capable to provide back-up altitude data to the crew also in case of A/C total loss of electrical power. In this case the ADDU, together with the Standby Horizon, is powered by the Emergency Power Unit, EPU 28-24 RMT, which can assure their use for a minimum of 30 minutes.

Figure 9-46. ADDU DISPLAY LAYOUT

ALTIMETRY 2 SWITCHING DEVICE

The Altimetry 2 Switching Device is a relay-based commutation device which enables, when activated by one of the two pushbuttons, the preselector alerter function on the ADDU and the transmission of the encoded altitude data from the ADDU itself to the active Transponder.

NOTE

In the RVSM Provision configuration the Switching Device is not operative.

ALTIMETRY 2 PUSHBUTTONS

The Switching Device is operated by the two Altimetry 2 pushbuttons installed on the pilot's and copilot's side of the instrument panel.

NOTE

In the RVSM Provision configuration the functions provided by the Switching Device are inhibited. This inhibition is achieved by keeping the pushbuttons not connected to the system.
Besides the pushbuttons are covered with non-transparent tape to hide the inscriptions.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic handling, service and maintenance instructions provided by Section 8 of the Pilot's Operating Handbook are necessary for this Supplement.

PILOT'S OPERATING HANDBOOK
AND
ENAC APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 28
FOR
RVSM OPERATIONS

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual to perform RVSM (Reduced Vertical Separation Minima) operations when the RVSM Optional Kit 80KA00075 is installed, or when the Piaggio Service Bulletin SB-80-0162 has been introduced, on the airplane.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The type design reliability and performance of the airplane has been evaluated in accordance with JAA Temporary Guidance Leaflet #6, Revision 1, "Guidance Material on the Approval of Aircraft and Operators for Flight in Airspace Above Flight Level 290 where a 300 M (1,000 ft) Vertical Separation Minimum is Applied", and FAA Memorandum 91-RVSM, Change 1, dated 30 June 1999, "Interim Guidance for Approval of Aircraft for Reduced Vertical Separation Minimum (RVSM) Flight".
The ENAC approval of this supplement constitutes Airworthiness Approval. Airworthiness Approval alone does not authorise flight into airspace for which an RVSM Operational Approval is required by an ICAO Regional Navigation Agreement.

ABBREVIATIONS

ADC	Air Data Computer
ADDU	Air Data Display Unit
ALI	Barometric Altitude Indicator
ANN LTS	Annunciator Lights
BAT	Battery
C/B	Circuit Breaker
EPB	Emergency Power Bus
EPU	Emergency Power Unit
ICM	Installation Configuration Module
LCD	Liquid Crystal Display
PWR	Power
RVSM	Reduced Vertical Separation Minima
SSEC	Static Source Error Correction
STBY	Standby

SECTION 2 – LIMITATIONS

The following limitations apply to the P-180 airplane when conducting RVSM operations:

1. If the airplane is equipped with an alternate static source, the Static Pressure Selector Valve must remain in the STATIC TUBE setting during normal operation in RVSM airspace.
2. The Pilot's and Co-pilot's displayed altitude must remain within ± 200 feet, at all times, during RVSM operation. If the Pilot's and Co-pilot's displayed altitude deviates by more than ± 200 feet, RVSM operations are not permitted.
3. If the RVSM Critical Region Visual Inspection criteria, listed at Page 9-312, are not met, the airplane is not allowed to operate in RVSM airspace.

NOTE

The static port of the Alternate Static Air Source System (if installed) does not affect the smoothness requirement of the RVSM Critical Region.

KIND OF OPERATION EQUIPMENT LIST (KOEL)

The following equipment must be installed and operational to enter and operate in RVSM airspace:

System and/or Component	*Number of items installed*	*RVSM Operations*
Air Data Computer ADC-85A	1	1
Pilot's Altimeter ALI-80A	1	1
Co-pilot's Altimeter ADDU	1	1
Altitude Preselector/Alerter PRE-80C	1	1
Autopilot	1	1
Transponder	2	1
ALTM2 / PRESEL / ENCDR Pushbutton	2	2
Switching Device	1	1

SECTION 3 – EMERGENCY PROCEDURES

EMERGENCY PROCEDURE CHECKLIST

CAUTION

During RVSM operations, the pilot should notify ATC of contingencies (equipment failures, weather) which affect the airplane capability to maintain the cleared flight level, and co-ordinate a plan of action appropriate to the airspace concerned, as soon as possible.

PILOT'S BAROMETRIC ALTIMETER (ALI) FAILURE

a) ALTM2/PRESEL/ENCDR Pushbutton - DEPRESS (if pushbuttons are OFF)

b) Co-pilot's ADDU selected altitude - CHECK and SET

c) ADC/ALI circuit breaker - RESET

NOTE

Autopilot will remain engaged.

PILOT'S AIR DATA COMPUTER FAILURE

a) Airplane Attitude and Altitude - MAINTAIN MANUALLY

b) ALTM2/PRESEL/ENCDR Pushbutton - DEPRESS (if pushbuttons are OFF)

c) Co-pilot's ADDU selected altitude - CHECK and SET

d) ADC/ALI - MSI/ADC circuit breakers - RESET

e) Altitude Deviation - MONITOR

NOTE

Do not attempt to re-engage the Autopilot.

The airplane must be maintained within ± 300 feet of desired flight level. An aural warning will be generated if the Altitude Deviation is greater than ± 200 feet.

COPILOT'S ALTIMETER (ADDU) FAILURE

a) ALTM2/PRESEL/ENCDR Pushbutton - CHECK IT IS OFF

b) ADDU/ADDU EMER Circuit Breaker - RESET

NOTE

A failure of the system notified by the STBY message may still leave the basic altimeter functions in an operable condition; however, the altimeter may not be usable for RVSM operations as it will not be corrected for static source error.

The PWR amber box notifies that the primary power input for the ADDU is lost. The ADDU is supplied by the Emergency Power Bus (EPU) through the ADDU secondary power input. The altitude data are still affordable in this condition.

PILOT'S PRESELECTOR/ALERTER FAILURE

a) ALTM2/PRESEL/ENCDR Pushbutton - DEPRESS (if pushbuttons are OFF)

b) Copilot's ADDU selected altitude - CHECK and SET

AUTOPILOT ALTITUDE HOLD MODE FAILURE

a) Airplane Attitude and Altitude - MAINTAIN AS DESIRED

b) Altitude Deviation - MONITOR

NOTE

The airplane must be maintained within ± 300 feet of desired flight level. An aural warning will be generated if the Altitude Deviation is greater than ± 200 feet.

AMPLIFIED EMERGENCY PROCEDURES

CAUTION

During RVSM operations, the pilot should notify ATC of contingencies (equipment failures, weather) which affect the airplane capability to maintain the cleared flight level, and co-ordinate a plan of action appropriate to the airspace concerned, as soon as possible.

PILOT'S BAROMETRIC ALTIMETER (ALI) FAILURE

When a failure of the Pilot's Barometric Altimeter occurs or when the altitude data are lost, a red warning flag comes into view in the ALI-80A altitude display window. The Pilot may attempt to reset the ALI by resetting the circuit breaker labeled ADC/ALI and by performing the instrument test.

Maintain airplane reference altimetry control by using the Co-pilot's Air Data Display Unit (ADDU).
If the ALTM2/PRESEL/ENCDR pushbutton is not illuminated (off), it should be depressed. Check for the appearance of digits in the ALT SEL section of the ADDU display and set the airplane reference altitude.

NOTE

Autopilot will remain engaged.

Corrective maintenance action should be performed prior to the next flight.

PILOT'S AIR DATA COMPUTER FAILURE

When the ADC-85A fails the ADC FAIL amber annunciator comes on to indicate the failure. Also the Autopilot red annunciator illuminates to indicate a failure in the Autopilot System. The Autopilot will automatically disengage.

NOTE

Do not attempt to re-engage the Autopilot.

The Pilot should manually maintain the airplane altitude.

Maintain airplane reference altimetry control by using the Co-pilot's Air Data Display Unit (ADDU).
If the ALTM2/PRESEL/ENCDR pushbutton is off, it should be depressed. Check for the appearance of digits in the ALT SEL section of the copilot's ADDU display and set the airplane reference altitude.

The pilot may attempt to reset the system by resetting the circuit breakers labeled ADC/ALI, MSI/ADC.

NOTE

The airplane must be maintained within ± 300 feet of desired flight level. An aural warning will be generated if the Altitude Deviation is greater than ± 200 feet.

Corrective maintenance action should be performed prior to the next flight.

COPILOT'S ALTIMETER (ADDU) FAILURE

Failure of one or more portions of the Copilot's ADDU may include the following indications on the ADDU display:

- Illumination of the STBY amber warning box
- Illumination of the PWR amber warning box
- Appearance of the OFF message in place of the digital readout
- A blank LCD display

Verify that the ALTM2/PRESEL/ENCDR pushbuttons are off (not illuminated).

The Pilot may attempt to reset the ADDU by resetting the circuit breakers labeled ADDU and ADDU EMER.

NOTE

A failure of the system notified by the STBY message may still leave the basic altimeter functions in an operable condition; however, the altimeter may not be usable for RVSM operations as it will not be corrected for static source error.

The PWR amber box notifies that the primary power input for the ADDU is lost. The ADDU is supplied by the Emergency Power Bus (EPU) through the ADDU secondary power input. The altitude data are still affordable in this condition.

PILOT'S PRESELECTOR/ALERTER FAILURE

When a failure of the Preselector/Alerter occurs or when incoming data from the barometric altimeter is lost, a red warning flag comes into view in the PRE-80C display.

Maintain airplane reference altimetry control by using the Co-pilot's Air Data Display Unit (ADDU).
If the ALTM2/PRESEL/ENCDR pushbutton is off, it should be depressed. Check for the appearance of digits in the ALT SEL section of the ADDU display and set the airplane reference altitude. The copilot's ADDU Altitude Alert funcion will automatically engage.

Corrective maintenance action should be performed prior to the next flight.

AUTOPILOT ALTITUDE HOLD MODE FAILURE

In the event of Autopilot Altitude Hold Mode failure the ALT annunciator (green) will flash. A complete failure of the Autopilot Altitude Hold function will necessitate manual control of the airplane to maintain cruise flight level.
The attitude and altitude should be maintained as desired.

NOTE

The airplane must be maintained within ± 300 feet of desired flight level. An aural warning will be generated if the Altitude Deviation is greater than ± 200 feet.

SECTION 4 – NORMAL PROCEDURES

NORMAL PROCEDURE CHECKLIST

PREPARATION FOR FLIGHT IN RVSM AIRSPACE

a) RVSM Critical Region (on Fuselage LH and RH side) - Visual Inspection

PREFLIGHT CHECK

a) Battery Switch - BAT
b) Avionics Switch - ON
c) ADDU configuration & LCD display - TEST
d) ALTM2/PRESEL/ENCDR pushbutton - TEST
e) Switching Device operation - CHECK

AMPLIFIED NORMAL PROCEDURES

PREPARATION FOR FLIGHT IN RVSM AIRSPACE

During the pre-flight and walk-around check procedure provided by Section 4 of the Pilot's Operating Handbook, a visual inspection of the Static Port region (RVSM Critical Region), on the Left and Right side of the fuselage, must be performed prior to all flights in RVSM airspace.

In particular:

– the skin surface inside the region (refer to Figure 9-47) must be inspected for visible damage or deformation, perhaps due to walkway damage, foreign object damage, service vehicles, etc.;
– the round static plate should be checked for dimpling, damage, cracks or other surface irregularities;
– the static port orifices must be inspected for elongation, deformation and/or obstruction from foreign matter.

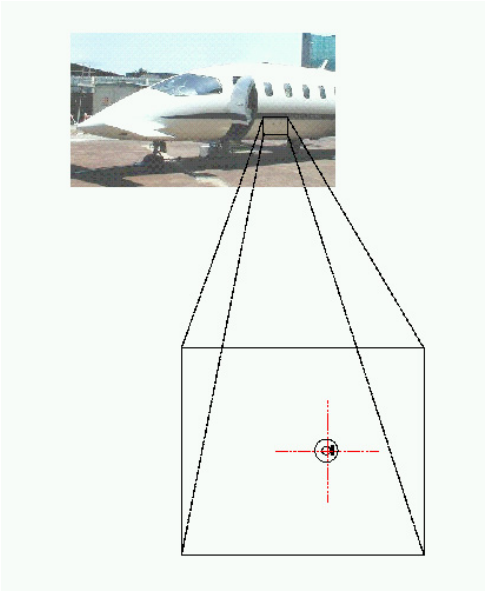

Figure 9-47. RVSM CRITICAL REGION (LEFT SIDE SHOWN)

PREFLIGHT CHECK

During the preflight check the pilot should perform all of the checks listed herein, in addition to the ADS-85 System "Preflight Checks" listed in Supplement 2, Page 9-39, of the Pilot's Operating Handbook.
The pilot should verify that the Battery switch is set to BAT position and Avionics switch is set to ON position.

Select on SYS TEST panel the ADC position, press the test button and hold. Verify that in addition to the basic test performed on the primary Air Data System, the following sequence is displayed on the ADDU:

- the ALT annunciator illuminates;
- the codes **A105**, **2YES** and **P180** are displayed for approximately 3 seconds;
- blank display for approximately 1 second;
- in the LCD field all the active elements illuminate until the test button is released.

Select on SYS TEST panel the ANN LTS position, press the test button and hold. Verify that in addition to the basic Annunciator System test, the ALT annunciator on the ADDU and the ALTM2/PRESEL/ENCDR pushbuttons illuminate.

Push alternately the Pilot's and the Copilot's ALTM2/PRESEL/ENCDR pushbuttons. Check that, each time, the pushbuttons illuminates and that the digits are displayed in the ALT SEL field of the ADDU LCD display.

SECTION 5 – PERFORMANCE

No Altimeter Calibration, as per Figure 5-9 (Section 5 of the Pilot's Operating Handbook), is required for the Copilot's Air Data Display Unit (ADDU).

SECTION 6 – WEIGHT AND BALANCE

EQUIPMENT LIST

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the RVSM Kit 80KA00075 is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-10	FLIGHT ENVIRONMENT DATA					
	RVSM KIT EQUIPMENT					
	- Air Data Display Unit ADDU (1) IS&S 9D-80130-32 with: - Installation Configuration Module ICM IS&S 9B-03508-72	3.00	15.10	0.45	1	
	- Altimetry 2 Switching Device Piaggio 80K118706-401	0.62	5.71	0.04	1	
	- Altimetry 2 Pushbutton IPP/Staco Switch 631421-029	0.07	16.00	0.01	2	
	(1) With software release 7H-7, Mod. A and tag "P180 LIGHTING" attached to the equipment case.					

SECTION 7 – DESCRIPTION AND OPERATION

The RVSM Kit consists of the following equipment:

– one Air Data Display Unit (ADDU) with one Installation Configuration Module (ICM);
– one Altimetry 2 Switching Device;
– two Altimetry 2 Pushbuttons.

The ADDU, with the ICM, and the two Altimetry 2 Pushbuttons are installed on the instrument panel: the ADDU is on copilot side, while the two pushbuttons are one on pilot's side and the other on copilot's side.
The Altimetry 2 Switching Device is installed in the pressurized compartment, behind the instrument panel.

AIR DATA DISPLAY UNIT

The Air Data Display Unit is a digital encoding altimeter, with data processing capabilities and Preselector/Alerter function. The ADDU operates with an Installation Configuration Module (ICM) connected to it, which contains Static Source Error Correction (SSEC) information.
Normally the ADDU provides barometric altitude display to the crew. Altitude Enconding and Preselector/Alerter functions are enabled by depressing either one of the two "Altimetry 2" pushbuttons.

The ADDU display layout is provided in Figure 9-48. The display is composed of a Digital Liquid Crystal Display (LCD) field, a dial with an elctromechanically-driven pointer, an Altitude Alert control knob, a test switch, a Barometric pressure setting knob and an Altitude Alert lamp.

The LCD has two main levels of backlight intensity: the "daytime" intensity (full bright) and the "nightime" one (lower than the previous). The ADDU itself decides which level to select, by sensing whether the +5 V circuitry for the dial illumination lamps is powered, by the A/C instruments lighting system, or not.
In the LCD field the complete altitude data are displayed, together with the baro setting and the amber warning boxes:

– PWR box: notifies that the ADDU is powered by the back-up power input only;
– STDBY box: notifies that the ADDU is not properly operating.

The baro setting capability is provided by turning clockwise or counter clockwise the BARO knob on the instrument bezel. By pushing the knob for more than 4 seconds, the measurement units of the baro setting are changed from hPa (or inHg) to inHg (or hPa). If the knob is pressed for less than 2 seconds, the default baro setting is displayed (1013 hPa or 29.92 inHg).
The barometric altitude display range is -1,000 to 55,000 feet.

When the Preselector/Alerter function is enabled, the ALT SEL knob on the bezel is used to set the altitude which is displayed in the lower left corner of the LCD field. The ALT lamp illuminates ± 1,000 feet of the selected altitude, when in acquisition mode, and at ± 200 feet when in deviation mode.
The ALT SEL control knob also contains a switch input for canceling the alerts.

The TEST switch in the ADDU bezel is used for maintenance purpose only.

During the ADC "preflight check" test, in the LCD field appears the information about the way the ADDU has been installed on the A/C. In the case of RVSM Kit, the following codes are displayed:

– "A105" is a default inscription which informs that the ADDU is not connected to the Autopilot System;
– "2Yes" informs that the ADDU has been installed on the copilot's side and that the Static Source Error Correction (SSEC) is applied;
– "P180"

The ADDU is provided with two electrical power inputs:

– a primary input, supplied by the Essential Avionics Bus, through the ADDU C/B on pilot's C/B panel;
– a secondary input, supplied by the Emergency Power Bus (EPB), through the ADDU EMER C/B on pilot's C/B panel.
The EPB is an additional bus electrically connected, in normal conditions, to the Left Single Feed Bus and supplied with electrical power by the EPU in electrical emergency conditions. For this reason the ADDU is capable to provide back-up altitude data to the crew also in case of A/C total loss of electrical power. In this case the ADDU, together with the Standby Horizon, is powered by the Emergency Power Unit, EPU 28-24 RMT, which can assure their use for a minimum of 30 minutes.

Figure 9-48. ADDU DISPLAY LAYOUT

ALTIMETRY 2 SWITCHING DEVICE

The Altimetry 2 Switching Device is a relay-based commutation device which enables, when activated by one of the two ALTM2/PRESEL/ENCDR pushbuttons, the preselector alerter function on the ADDU and the transmission of the encoded altitude data from the ADDU itself to the active Transponder.

ALTIMETRY 2 PUSHBUTTONS

The Switching Device is operated by the two ALTM2/PRESEL/ENCDR pushbuttons installed on the pilot's and copilot's side of the instrument panel.

When one of the two Altimetry2 pushbutton is depressed, both the pushbuttons light up, the ADDU is set as the source for the active Transponder and the ADDU Preselector/Alerter function becomes enabled.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic handling, service and maintenance instructions provided by Section 8 of the Pilot's Operating Handbook are necessary for this Supplement.

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PILOT'S OPERATING HANDBOOK
AND
ENAC APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 29
FOR
TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS I)

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual to perform TCAS I operations when the Traffic Alert and Collision Avoidance System (TCAS I) Optional Kit 80KA00074 is installed (with Mod. N. 80-0440), or when the Piaggio Service Bulletin SB-80-0177 has been introduced on the airplane.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The SKY899 (TCAS I) is an on-board traffic situation system which monitors the surrounding airspace, by interrogating any intruding aircraft transponder. The traffic information, which include relative range, altitude, bearing and closure rate of other transponder-equipped aircrafts, are then computed to predict collision threats.
The SKY899 displays traffic information on the MFD-85C EFIS Multifunction Display and generates aural warning through the Cockpit Audio System.

ABBREVIATIONS

AGL	Above Ground Level
ALT	Pressure Altitude
ATC	Air Traffic Control
CPA	Closest Point of Approach
FL	Flight Level
MFD	Multi Function Display
OPR	Operating Mode
OT	Other Traffic
STBY	Standby Mode
TA	Traffic Advisory
TCAS	Traffic Alert and Collision Avoidance System
TFC	TCAS Traffic Display Mode
TRC	Transmitter Receiver Computer
TEST	Test Mode
WOW	Weight On Wheel

DEFINITIONS

TRAFFIC ADVISORY	Threat information given to the pilot pertaining to the position of intruding aircraft in the immediate vicinity.
PROXIMATE TRAFFIC	Any traffic not generating a TA but which is within 4 nmi range and within ± 1200 feet vertically.
OTHER TRAFFIC	Any traffic within approximately 35 nmi range and within ± 9900 feet vertically (max. range), that is not proximate traffic or traffic generating a TA.

SECTION 2 – LIMITATIONS

The following limitations apply to the P-180 airplane when conducting TCAS I operations:

1. The Pilot should not maneuver the aircraft based solely on the traffic displayed by TCAS I.
   Information shown on the display is provided to the Pilot as an aid to visually acquiring traffic. Maneuvering the aircraft should be based only on ATC guidance or positive visual acquisition of the conflicting traffic.
2. TCAS I system provides no indication of aircrafts without operative transponders.

KIND OF OPERATION EQUIPMENT LIST (KOEL)

TCAS I requires the following equipment to be functional and operating:

System and/or Component	*Number of items installed*	*TCAS I Operations*
Transmitter Receiver Computer TRC899	1	1
TCAS I Control Panel	1	1
Directional Antenna NY156	1	1
Multifunction Display, MFD-85C	1	1
Air Data Computer ADC-85 ( )	1	1
Pilot Encoding Altimeter ALI-80( )	1	1
Directional Gyro	1	1
Radio Altimeter	1	1
EFIS Processors, MPU-85N and DPU-85N (status -008)	2	2
Mutual Suppression Bus	1	1
Main Landing Gear WOW Micro-switch (on ground)	1	1

SECTION 3 – EMERGENCY PROCEDURES

System failures are announced as follows:

a. TCAS COMPUTER FAILURE
   If a TCAS computer failure occurs, the yellow "TCAS-FAIL" flag appears in all modes of the MFD.

b. TCAS DATA DISPLAYING FAILURE
   If there is an EFIS TCAS data displaying failure, the yellow "TD-FAIL" flag appears in all modes of the MFD.

NOTE

The "TD-FAIL" flag also appears when the TCAS computer is switched off.

If "TCAS-FAIL" or "TD FAIL", with TCAS computer ON, is annunciated on the Multi Function Display or if the "Traffic Advisory System Test Failed" aural annunciation occurs, turn the TCAS I System OFF.

SECTION 4 – NORMAL PROCEDURES

INITIALIZATION (SELF-TEST)

a. After Engine starting verify that the TCAS I Circuit Bracker is engaged.
b. Set the Avionics Switch to ON.
c. After being initialized, the system automatically cycles through a power-on SELF-TEST.
d. If the system passes the test:

   On ground:
   – The system goes automatically in Stand-by (STBY) mode.
   – To switch to Operating mode, depress the OPR/STBY pushbutton.

   In flight:
   – The system goes automatically in Operating (OPR) mode.
e. The Traffic screen appears provided that the TCAS display mode is selected on the MFD-85C through the TFC control.

SELF-TEST

a. With the system in STBY or Failed mode set the TEST switch to ON.
b. The self-test routine begins and the white "TCAS-TEST" annunciator appears on the MFD display; the range is set to 5 nmi, "Above and Below" traffic is disabled, "Other Traffic" is displayed and the Relative Altitude mode is set.
c. After the completion of the self-test the "Traffic Advisory System Test Passed/Failed" aural message is heard on the Audio line.

NOTE

Perform the system self-test before the first flight of the day and whenever the system shows a failure condition.
The system self-test function is available only when the aircraft is on the ground.

TRAFFIC ADVISORY ANNUNCIATION

A TA is annunciated by an aural "TRAFFIC TRAFFIC" message on the Cockpit Audio System and a yellow filled circle shown on the TCAS display (and on the RDR/NAV display).

A TA is generated when the following conditions occure:

Cruise (altitude above 2000 feet AGL):
a. the intruder is within a 0,2 nmi horizontal radius and a ± 600 feet relative altitude range, or
b. the intruder is approximately within 15 - 20 seconds from CPA.

Takeoff and Landing (altitude below 2000 feet AGL):
a. the intruder is within a 0,55 nmi horizontal radius and a ± 800 feet relative altitude range, or
b. the intruder is approximately within 20 - 30 seconds from CPA.

Below 400 feet AGL the aural "TRAFFIC TRAFFIC" message is inhibited.

When the own aircraft altitude is below 1700 feet AGL, ground intruders (below 380 feet AGL) are filtered out.

A TA symbol remains on the screen for at least 8 seconds even if the intruder aircraft no loger meets the TA criteria.

RECOMMENDED FLIGHT CREW PROCEDURES

When a TCAS I Traffic Advisory (TA) is issued:

1. The flightcrew should attempt to visually acquire the intruder aircraft and to attain/ maintain safe separation in accordance with regulatory requirements and good operating practices.
2. When the flightcrew cannot visually acquire the intruder aircraft but perceives the intruder as a threat, the crew may contact ATC to obtain information that might help in locating the intruder aircraft.
3. TCAS I TA display information is inadequate for collision avoidance maneuvers.
   Pilots should not maneuver based solely on TA information. A Pilot maneuver based only on this information might result in a loss of separation with the intruder (e.g., a turn toward the intruder).
   Pilots should maneuver only on receiving guidance from ATC or on acquiring visual contact with the intruder.

General recommendations:

a. Pilots will operate TCAS at all times when airborne, in all meteorological conditions.

b. TCAS does not diminish or otherwise alter the pilot's authority or responsibility to ensure safe seperation. The pilot should maintain frequent outside visual scan and "see and avoid" vigilance.

c. TCAS should not be activated until cleared for takeoff. TCAS should be deactivated after clearing an active runway following a landing (select the STBY mode).
   TCAS is not designed to assist in taxiing across active runways or at any other time for groung operations.

d. To enhance situational awareness during flight, the TCAS display should be used in a range setting appropriate to the phase of flight.

e. TCAS I can only detect aircrafts which are transponder equipped.

COMBINED TCAS I & TAWS OPERATIONS

When both TAWS and TCAS I Systems are installed on the airplane, if a TAWS alert or altitude callout condition and a Traffic Advisory condition exist at the same time, the Traffic Advisory aural message is delayed with respect to the TAWS alert or callout aural annunciation.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 6 – WEIGHT AND BALANCE

EQUIPMENT LIST

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the TCAS I Optional System is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-40	INDEPENDENT POSITION DETERMINING					
	TCAS I SYSTEM					
	- Transceiver/Computer Unit TRC899 BFGoodrich 805-11900-001 with:	9.88	220.00	21.74	1	
	- System Configuration Module BFGoodrich 814-18005-001					
	- Directional Antenna NY156 Goodrich 805-10003-001	2.29	117.00	2.68	1	
	- TCAS I Control Panel Piaggio 80K118713-401	0.69	50.00	0.15	1	
34-20	ATTITUDE AND DIRECTION					
	- Multif. Display Unit MFD-85C (1) Collins 622-9849-012	9.64	16.75	1.61	1	
	- Display Processor Unit DPU-85N (2) Collins 622-8678-008 with:	13.70	- 16.50	2.26	1	
	- Multif. Processor Unit MPU-85N (2) Collins 622-8679-008	17.47	- 16.50	2.88	1	
	(1) Replaces the basic MFD-85B (2) Replace EFIS 85B Processors status -002 or -014.					

SECTION 7 – DESCRIPTION AND OPERATION

The TCAS I System consists of the following main components:

– Directional Antenna - NY156
– Transmitter Receiver Computer - TRC899, equipped with the System Configuration Module
– TCAS I Control Panel

Furthermore, the TCAS I System displays traffic information on the EFIS Multifunction Display, MFD-85C, and generates aural warning on the Cockpit Audio System.

The electrical power for the TCAS I System operation is supplied by the Right Avionics Bus through the TCAS 1 Circuit Breaker on the Co-pilot CB Panel.

DIRECTIONAL ANTENNA (NY 156)

The Directional Antenna transmits omni-directional interrogations and receives directional replies from other transponder-equipped nearby aircrafts.
It is installed on the top forward fuselage, slightly shifted to the right from the centerline (looking in flight direction), between frame 22 and 23.

TRANSMITTER RECEIVER COMPUTER (TRC 899)

The Transmitter Receiver Computer is installed inside the cabinet vanity closet and is the primary unit of the TCAS I System. The TRC performs the following functions:

– processes the data coming from the directional antenna;
– provides output data representation of intruding aircrafts and determines aural and visual traffic advisories.

The TRC interfaces with the following equipment:

– Air Data Computer, ADC-85( ), through the Pilot Encoding Altimeter, ALI-80( ), for barometric altitude data information;
– Directional Gyro, for heading data information;
– Radio Altimeter, which provides for the radio altitude data that determines the TCAS I System Sensitivity Level;
– EFIS Processors, MPU-85N and DPU-85N (status -008), for the transmission of the output data to the Multifunction Display;
– Cockpit Audio System, for the generation of Aural Warnings;
– Main Landing Gear WOW Micro-switch, for the TCAS interrogation inhibition on-ground;
– Mutual Suppression Bus, which suppresses own aircraft's transponder from replying to own aircraft TCAS interrogations and prevents TCAS from interrogating while own aircraft's transponder is replying to other interrogations.

The TRC is provided with a "System Configuration Module" which is used to store the aircraft installation dependent information (e.g., aircraft type, discrete inputs, speed of data bus, etc.).

TCAS I CONTROL PANEL

The System is controlled by a STBY/OPR pushbutton and an ON/OFF TEST switch installed on the TCAS I Control Panel in the Central Pedestal or in the Pilot's Instrument Panel (as applicable). The STBY/OPR pushbutton is used to switch between the Standby and the Operating modes. The TEST switch controls the initialization of the System Self Test.

MULTIFUNCTION DISPLAY (MFD-85C)

The Multifunction Display, MFD-85C, located on the center of the instrument panel, is equivalent to the basic MFD-85B, described in Supplement 3, but includes the further capability of managing and displaying the TCAS I traffic information.

The top left key (TFC) on the MFD-85C (see Figure 9-49) allows the selection of the TCAS Traffic Display instead of the Weather Radar available on the MFD-85B (refer to Page 9-66). In this MFD version, the second key (RDR/NAV) cycles modes from Navigation to Radar, to both Navigation and Radar then back to Navigation.

TFC (TRAFFIC) FORMAT

The TCAS Traffic Display is a Heading Up display which shows the relative positions and altitude of other nearby aircrafts.

The Traffic format has an aircraft symbol positioned in the center of the Range Rings.

Ranges:

The ranges that can be displayed are of 5 nmi, 10 nmi, 20 nmi and 40 nmi. To move from one range to the other the up and down delta keys on the MFD bezel have to be used.

The value of the current range, expressed in nautical miles, is displayed in white on the upper right side of the display. The outer ring, representative of the current range, is a solid white line with tick marks at each of the twelve o' clock position; the other two rings are a dashed half range ring and a 2 nmi dotted range ring.
The 2 nmi range ring is not visualized in the 40 nmi range.

Traffic Symbols:

The symbols that are associated to the three traffic types are the followings:

Traffic Advisory:	Yellow filled circle (●)
Proximate Traffic:	Cyan filled diamond (◆)
Other Traffic:	Cyan open diamond (◇)

Climb/Descend Arrows:

The intruder vertical trend is pointed out by an arrow displayed on the right side of the intruder simbol.

Off Scale Intruders:

The yellow annunciation "OFF SCALE" (see Figure 9-49) indicates that there is a threat but not in the current display area. To see the position of the threat aircraft the range should be increased.

No Bearing Traffic:

If a TA does not have a bearing associated with it, the intruder's altitude and range are given in the lower portion of the display preceded by "TA" (see Figure 9-49). A maximum of two no bearing intruders can be displayed at one time.

Altitude Data Tags:

Relative Altitude Format: (ref. to Figure 9-49) the relative altitude represents the difference between the own aircraft altitude and the intruder's altitude. When the display is in this mode the altitude data tag is represented by two digits (hundred of feets) preceded by "+" or "-" and placed above or below the intruder symbol in the event the intruder is above or below respectively.

Absolute Altitude Format: (ref. to Figure 9-50) the aircraft absolute altitude is displayed in the lower corner preceded by "ALT" for pressure altitude or "FL" (Flight Level) for standard pressure altitude and the intruder altitude data tag is represented by three digits (hundreds of feet or Flight Level respectively) placed above the threat symbol if the intruder is above, below if it is below.

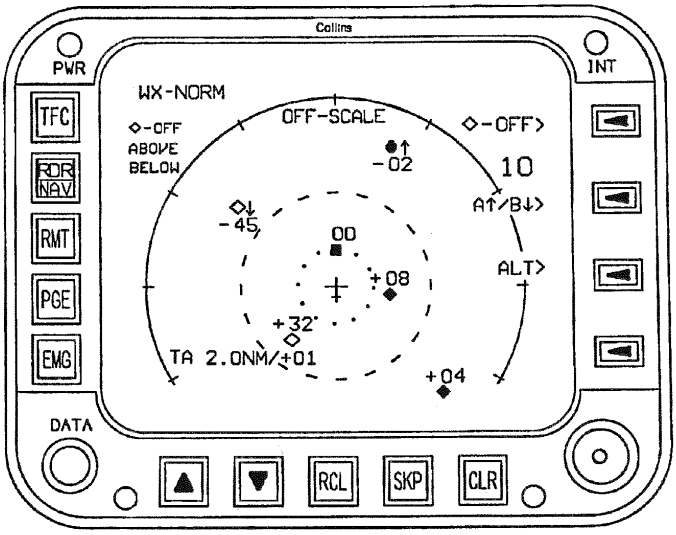

Figure 9-49. TCAS I Relative Altitude Display

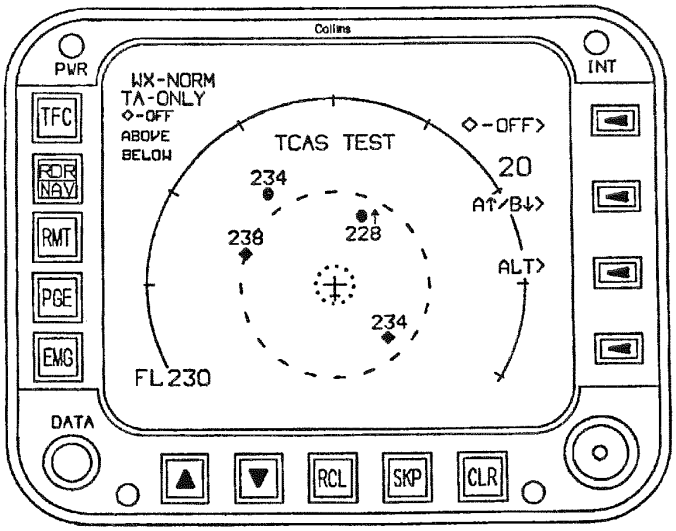

Figure 9-50. TCAS I Absolute Altitude Display

TCAS Annunciations:

The following TCAS computer modes are displayed :

"TCAS OFF" (white), on the upper left corner of the display, if the TCAS computer is in Standby mode.

"TA ONLY" (white), on the upper left corner of the display, if the TCAS computer is in Operating mode. If a TA is present, the annunciator becomes yellow and flashes between high and low intensity.

"TCAS TEST" (white), in central position, if the TCAS computer is in the TEST mode.

"TCAS-FAIL" (yellow), in the center of the display, if there is a TCAS computer failure.

"TD-FAIL" (yellow), in the center of the display, if there is an EFIS TCAS data displaying failure or the TCAS computer is switched off.

Display Option Menu:

A menu is available on the right side of the display to allow the selections of the following options (ref. to Fig. 9-49 and Fig. 9-50):

"Other-off" The first selection key is used to select/deselect OT symbol from the traffic display.

"Above/Below" The second selection key is used to select aircrafts which have a relative altitude of more then 2700 ft above or below, according to the following sequence:

SELECTION	ALTITUDE RANGE
Neither Above nor Below	- 2700 to + 2700 ft
Above	- 2700 to + 9900 ft
Below	- 9900 to + 2700 ft
Above and Below	- 9900 to + 9900 ft

"Altitude" The third selection key is used to select the altitude format (absolute or relative).

NAV/RDR (NAVIGATION & RADAR) FORMAT

TCAS traffic symbols and associated data can be displayed also in the navigation and radar modes (ref. to Figure 9-51).

In the RDR/NAV modes the third selection key ("TFC") on the right side of the display permits to select/deselect TCAS traffic. When TCAS traffic is selected a green "TFC" annunciation is displayed on the upper left corner under the "NAV" and "RDR" mode annunciations.

The TCAS computer mode is displayed on the upper left corner of the display just under the "TFC" annunciation. When a failure occurs the mode annunciation is replaced by the "TD-FAIL" or "TCAS-FAIL" flag.

The visualization of TCAS Traffic is the same as in the TCAS Traffic display except for the Absolute Altitude format which, in the RDR/NAV modes, is not available.
TCAS Display Options can be changed only in the TFC mode.

When a TA is annunciated a yellow "TRAFFIC" annunciation appears in the center of the navigation and radar display and TCAS Traffic is displayed, if not already selected.

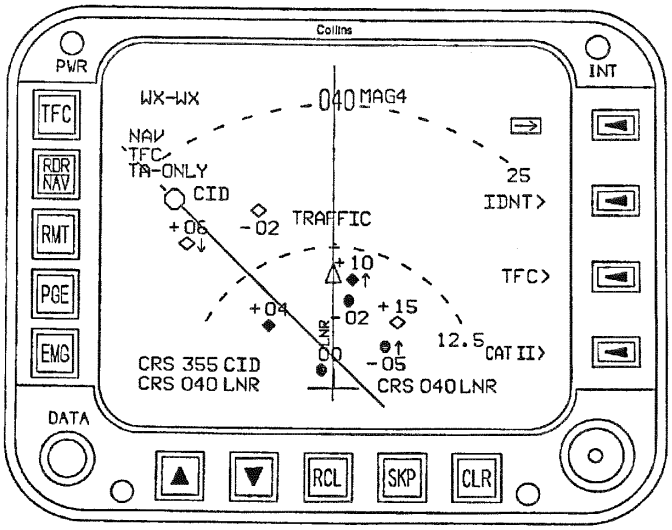

Figure 9-51. TCAS Traffic Symbols in Navigation mode

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic handling, service and maintenance instructions provided by Section 8 of the Pilot's Operating Handbook are necessary for this Supplement.

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PILOT'S OPERATING HANDBOOK
AND
ENAC APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 30
FOR
UNIVERSAL AVIONICS SYSTEMS CORPORATION UNS-1L MMMS
FLIGHT MANAGEMENT SYSTEM

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Universal Avionics Systems Corp. UNS-1L MMMS (Software configuration 901.x) Flight Management System (FMS) is installed on the P.180 airplane standard equipped with Collins avionics systems; among them the FMS is interfaced with the following ones: EFIS-85B4 Pilot's Flight Instruments, ADS-85 Digital Air Data System, VIR-32 Primary VOR/ILS Receiver, DME-42 DME Receiver, MCS-65 Compass System.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and the Approved Airplane Flight Manual.

The UNS-1L is a multisensor area navigation system basically consisting of a cockpit mounted Flat Panel Control Display Unit (FPCDU), a remote mounted Navigation Computer Unit (NCU, interfaced with the aircraft navigation sensors, EFIS and Autopilot through EFIS), and a Portable Data Transfer Unit (DTU).
The NCU incorporates a TSO C-129a Class A1, B1 and C1 approved GPS receiver performing a predictive Receiver Autonomous Integrity Monitoring function (RAIM) to evaluate the expected system accuracy and verify the minimum requirements for the specific phase of flight are met.
Satellite navigation is based upon use of only the Global Positioning System operated by the United States of America.

The UNS-1L, as installed on the P.180, can provide lateral navigation guidance for enroute, terminal and approach operations (both manual and autopilot/flight director coupled) and advisory vertical navigation guidance for enroute operations.
The UNS-1L, as installed on the P.180, is also eligible for approval of both B-RNAV operations in European airspace and NAT-MNPS "ICE GREEN" routes. In addition, in flight maneuvers including pre-defined Search Pattern (Special Missions) are implemented as well.

SECTION 2 – LIMITATIONS

a. OPERATOR'S MANUAL

Prior to flight, whenever navigation is predicated on the use of the UNS-1L, the flight crew must identify the software version (SCN) by FPCDU readout (on the initialization page) and verify that the applicable Operator's Manual is available for use.

– For SCN 901.x the Universal Avionics Systems Corp. Report No. 2423sv801/901 dated August 22, 2001 (or later revision) containing the Multi-Mission Management System Supplement (located behind the SPECIAL MISSION Tab) must apply.

b. DATA BASE

Check the Data Base expiration date by FPCDU readout. If the Data Base is expired, IFR navigation is prohibited unless the pilot verifies each waypoint and navaid to be used for accuracy by reference to current approved data.

Navigation Data Base (D/BASE) Limitations:

– The D/BASE must be updated to the latest revision every 28 days. Standard data for updating, based on Jeppesen data base, are provided by Universal Avionics Systems Corp. on a 28 days cycle. Update diskettes will be received by mail to subscribers several days before the effective date of applicability.

– The D/BASE loading/updating shall be performed following the procedures included in the Operator's Manual referenced above by means of the Portable Data Transfer Unit.

c. LATERAL NAVIGATION

The UNS-1L is approved for VFR/IFR enroute, terminal area, RNAV and non precision approach (using the WGS-84 co-ordinate reference datum) operations in accordance with the criteria of FAA AC 20-130A and provided the system is receiving adequate usable signals from approved sensors.

The UNS-1L, as installed on the P.180, is approvable for B-RNAV operations in designated European airspace both in general terms and, due to the advanced features of its internal GPS, for routes predicated on GPS coverage only, if used in conjunction with the Universal Avionics System Corp. Off Line RAIM prediction program (P/N 10751 with SCN 10.x or later approved versions). The previous statement is in accordance with JAA Leaflet No. 2 Rev. 1, but it does not constitute an operational approval.

The UNS-1L, as installed on the P.180, is approvable for operations in NAT-MNPS "ICE GREEN" published routes when used in conjunction with the Universal Avionics System Corp. Off Line RAIM prediction program (P/N 10751 with SCN 10.x or later approved versions) which must assure that sufficient GPS integrity will exist for the proposed route of flight. The previous statement is in accordance with the criteria of ENAC/RAI Circular Letter No.48 dated October 23, 1997, but it does not constitute an operational approval.

d. VERTICAL NAVIGATION

Vertical Navigation information (displayed on the pilot's EFIS in enroute and terminal modes) is advisory only and is to be used under the pilot responsibility only when navigation in based on UNS-1L.

e. APPROACH MODE

WARNING

During Flight Director or Autopilot operations, when the Approach mode is activated on the FMS:
- APR must not be selected on the autopilot controller;
- Only NAV may be selected on the autopilot controller.
In the above condition, selection of APR on the autopilot controller will result in an erroneous response from either the flight director or the autopilot even though normal operating conditions are annunciated.

Instrument approaches must always be accomplished in accordance with approved instrument approach procedures as are retrieved by the UNS-1L Data Base, that must incorporate the current update cycle.

– Accomplishments of ILS, LOC, LOC B/C, LDA, SDF and MLS approaches are not authorized.
– The UNS-1L, as installed on the P.180, is approved for the following approaches: VOR, VOR-DME, RNAV, VFR (Pilot aid only) and, in accordance with the State of operator/ registry (as applicable) Aviation Authority requirements, for GPS and GPS overlay NDB.
– Lateral Flight Director and Autopilot coupled approaches are only approved if the UNS-1L is in the FMS approach mode (which provides the proper HSI display of lateral deviation).
– When using the GPS for approach guidance, the GPS integrity monitoring (RAIM) must be available at the final approach fix (FAF).
– GPS may only be used if the reference coordinate datum is WGS-84.

f. NAVIGATION EQUIPMENT

When using the FMS, the airplane must have other approved navigation equipment installed and operating appropriate to the route of flight.

g. SYSTEM FLAG

Navigation should not be predicated on the use of the FMS when the associated information is flagged (FMS1 red flag on EFIS displays). Following a period (5 minutes or more) of invalid operation (FMS1 flag in view), the FMS position should be verified and updated as required.

h. SYSTEM POSITION

The FMS computed position must be checked for accuracy (reasonableness, by visually sighting ground reference points and/or by using other onboard approved navigation equipment and/or a radar fix) prior to use as means of navigation and under the following conditions:

– Prior to each compulsory reporting point during IFR operation when not under radar surveillance or control.
– At or prior to each enroute waypoint during RNAV (B-RNAV in European airspace) operations along approved RNAV (B-RNAV in European Airspace) routes.
– Prior to requesting off-airway routing, and at hourly intervals thereafter during RNAV (B-RNAV in European Airspace) operations.

During periods of POSITION UNCERTAIN navigation shall not be predicated on the use of the FMS.

Whenever the accuracy check reveals a system error greater than the one stated for each phase of flight (see for limits the Operator's Manual) or following a period of POSITION UNCERTAIN, the FMS position should be updated as required for the specific type of operation, by one among the following methods: visually sighting ground reference points, using a radar fix, using other onboard approved navigation equipment.

i. LATITUDE LIMITS

When operating outside the magnetic compass Variation Area (North of 70° north latitude or South of 60° south latitude) the pilot must manually enter magnetic variation.

j. FUEL DISPLAY

Fuel display parameters, being only related to manually entered data, must be used under the pilot's responsibility and do not replace primary fuel quantity or fuel flow gage for fuel load and range planning.

k. PLACARD

On the left side of the instrument panel glareshield close to the autopilot controller:

APR MODE MUST NOT BE ENGAGED WHILE L-NAV IS SELECTED

SECTION 3 – EMERGENCY PROCEDURES

If navigation information from the FMS is intermittent or lost or flagged, use the remaining operational navigation equipment as required (position the CRS selector on EFIS DSP to VOR/ LOC).

System failures or abnormalities are indicated by the "MSG" (message) amber light annunciator on the instrument panel (as well as on EFIS displays) and are spelled out on the FPCDU CRT display when the MSG key (on the FPCDU itself) is depressed. Each system message should be noted and appropriate action taken by referring to the applicable Operator's Manual.

If GPS RAIM becames unavailable (as evidenced by the "MSG" and "GPS" remote annunciators):

– do not continue Approach based upon GPS alone;
– continued navigation using GPS position is possible checking position every 15 minutes with another approved navigation system;
– continue either B-RNAV or NAT-MNPS "ICE GREEN" routes navigation based on GPS alone if it is possible to confirm an acceptable level of navigation performance through aiplane position cross-check with other available navigation equipment information. Otherwise revert to an alternative means of navigation.
– apply the instructions contained in the Operator's Manual for the other specific phases of flight.

SECTION 4 – NORMAL PROCEDURES

a. OPERATION

Normal operating procedures are outlined in the applicable Operator's Manual as per Section 2 (a).

b. SYSTEM ANNUNCIATORS

The UNS-1L installation on the P.180 includes two remote annunciator assemblies housed on the pilot's side of the instrument panel (above the EFIS EADI display). The one on the left incorporates the MSG (top), WPT (bottom left) and GPS (bottom right) amber light annunciators. The other incorporates the APPR (top), HDG (bottom left) and XTK (bottom right) amber light annunciators.
The meaning of each annunciator is described below (see also the UNS-1L Operator's Manual for further details):

MSG (message)
The MSG amber annunciator will illuminate and flash in conjunction with the MSG light on the FPCDU and MSG annunciator on EFIS displays indicating that a new message has become active on the FPCDU message page(s).

WPT (waypoint alert)
The WPT amber annunciator will illuminate in conjunction with the blinking waypoint alert symbol on EFIS displays, about two minutes prior to the point of a leg change on a navigation leg or about 15 seconds prior to an approach waypoint. This may vary according to ground speed and amount of course change. When the WPT light illuminates, depressing the MSG key on the FPCDU will display the appropriate message. The light will automatically extinguish when the leg change occurs.

GPS (GPS integrity monitoring)
The GPS amber annunciator is illuminated whenever the integrity of the GPS position cannot be assured to meet the minimum requirements for the particular phase of flight (oceanic, enroute, terminal or approach). Whenever the GPS annunciator is illuminated the pilot should monitor his GPS position by cross reference to other navigation sensors. The GPS must not be used for guidance whenever the GPS annunciator is lit. A list of the pilot's actions to be taken when the GPS annunciator is active, for each particular phase of flight and FMS navigation status, is included in the Operator's Manual.

APPR (FMS approach mode)
The APPR amber annunciator will illuminate in conjunction to the FMS approach annunciator on EFIS displays, whenever the approach mode has been activated on the FMS. When the APPR light is on, the autopilot/flight guidance outputs are referenced to the waypoints on the pilot defined approach. This annunciator will extinguish when the FMS approach mode is cancelled.

HDG (FMS heading mode)
The HDG amber annunciator will illuminate, in conjunction with the FMS heading annunciator on EFIS displays, whenever the heading mode navigation option is selected on FMS. When this light is on, the autopilot/flight guidance outputs are referenced to the heading selected by the pilot on the FMS rather than to the active FROM-TO leg. This annunciator will extinguish as the FMS heading mode is cancelled (either automatically or manually). For additional details see Section 7 of this Supplement.

XTK (selected crosstrack)
The XTK amber annunciator will illuminate when a course parallel to the current navigation leg is selected. The XTK light will extinguish when the parallel course offset is cancelled either manually or automatically at the next leg change.

c. AIRCRAFT INTERFACE

The following procedure supplements the operating instructions in the Operator's Manual.

1. To select the FMS as active navigation source for EFIS and Autopilot/Flight Guidance system, position the CRS selector on EFIS DSP panel to LNAV.

   When LNAV is selected on EFIS DSP (FMS1 annunciated) the information displayed on EFIS include the following:

LATERAL DEVIATION	FMS Crosstrack or Pseudo-LOC deviation. ENROUTE: 7.5 nm full scale APPROACH: angular
TO/FROM	FMS waypoint to/from indication.
FMS1 annunciator/flag	FMS valid/invalid.
FMS1 autopilot annunciator	Autopilot coupled to FMS.
FHDG1 autopilot annunciator	Autopilot coupled FMS heading mode.
COURSE (arrow & display)	FMS desired track as read against the azimuth card.
BEARING POINTER	FMS bearing-to waypoint.
WAYPOINT	Waypoint identifier and location (respect to the aircraft position).
DISTANCE TO WAYPOINT	FMS distance to TO waypoint.
APPR annunciator	FMS approach mode.
VERTICAL DEVIATION	FMS VNAV deviation (500 ft/dot).
WIND SPEED & DIRECTION	FMS computed wind data.
DR annunciator	FMS in Dead Reckoning mode.
MSG annunciator	FMS message.

2. Flight Director operation:

   Once the navigation leg or the pseudo VOR mode has been selected and FMS1 is annunciated on EFIS, the Flight Director can be coupled by depressing the NAV key on the Autopilot Controller. FMS1 mode annunciation (green) is provided on EFIS top left.

   Proper deviation signals are provided by the FMS to the Autopilot/Flight Guidance Computer (through the EFIS processors) to drive the pilot's (and copilot's) ADI command bars (V-bars) in accordance to the selected path.

   When the approach mode is activated on the FMS, the V-bars are driven according to the lateral deviation signals generated by the FMS provided that NAV is selected on the Autopilot Controller.

   CAUTION

   When the approach mode is activated on the FMS, APR must not be selected on the autopilot controller and therefore AP coupled GO-AROUND will not be available.

   Vertical guidance during FMS approach is not provided in the P.180 installation.

3. Autopilot operation

   Once the navigation leg or the pseudo VOR mode has been selected and FMS1 is annunciated on EFIS, the Autopilot can be coupled by depressing the NAV and AP ENG keys on the Autopilot Controller. FMS1 mode (green) is annunciated on EFIS top left in addition to AP (and YD).

   Proper deviation signals are provided by the FMS to the Autopilot/Flight Guidance Computer (through the EFIS processors) to drive the pilot's (and copilot's) ADI command bars (V-bars) and control servos in accordance to the selected path.

   When the approach mode is activated on the FMS, the V-bars and the control servos are driven according to the lateral deviation signals generated by the FMS provided that NAV is selected on the Autopilot Controller.

   CAUTION

   When the approach mode is activated on the FMS, APR must not be selected on the autopilot controller and therefore AP coupled GO-AROUND will not be available.

   Vertical guidance during FMS approach is not provided in the P.180 installation.

4. VNAV

   VNAV mode must be disabled before deselecting LNAV on EFIS DSP.

5. Data Transfer

   The FMS can be powered just with the airplane BATTERY switch set to ON, while the airplane AVIONICS master switch is OFF. This condition allows connecting the portable Data Transfer Unit (DTU) for data loading into the FMS, before the engine starting, with the other avionics equipment not powered for battery saving.

   CAUTION

   The FMS must be switched OFF before the Engine starting procedure is initiated in order to avoid possible system damaging.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 6 – WEIGHT AND BALANCE

EQUIPMENT LIST

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the Universal Avionics Systems Corp. UNS-1L Flight Management System is installed.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-50	DEPENDENT POSITION DETERMINING					
	UNS-1L MMMS FLIGHT MANAGEMENT SYSTEM					
	- Navigation Computer (NCU) Universal Avionics Sys. Corp. 2116-30-1116	6.50	- 16.50	- 1.07	1	
	- Mount, Navigation Computer Universal Avionics Sys. Corp. 80009000	1.20	- 16.50	- 0.20	1	
	- Control Display Unit (CDU) Universal Avionics Sys. Corp. 1117-1-104	2.60	37.70	0.98	1	
	- GPS Antenna Universal Avionics Sys. Corp. 10706	0.50	158.50	0.80	1	

SECTION 7 – DESCRIPTION AND OPERATION

The UNS-1L Flight Management System (FMS) basically consists of a Navigation Computer Unit with an internal GPS receiver (NCU), a Configuration Module, a Flat Panel Control Display Unit (FPCDU), a GPS antenna, the remote annunciators, and a Portable Data Transfer Unit (DTU).

The Control Display Unit (FPCDU) is located in the cockpit pedestal and allows the control and monitoring of the system and all the associated sensors.

The Navigation Computer Unit (NCU), located in the nose avionics bay, houses the system's central processing unit, a TSO C-129a approved GPS receiver, the navigation sensors interface circuits, the instruments (EFIS) interface and the navigation Data Base.

In the P.180 installation the NCU receives navigation inputs from the Primary VOR/DME (Collins VIR-32/DME-42), the Primary Compass System (Collins MCS-65), the Digital Air Data System (Collins ADS-85), and accepts weather radar "joystick" waypoint definition input from EFIS system (Collins EFIS 85-B4 three-tube).
Digital and/or analog outputs, as appropriate, are provided to EFIS, Primary VOR/DME (for tuning) and to the MSG/WPT/APPR/XTK/HDG remote annunciators located on the pilot side of the instrument panel (see Section 4 of this Supplement).

The NCU can also accept navigation information from other compatible sensors (if installed) also allowing (in some cases) remote tuning via the CDU.

The configuration data specific to the airplane are written in the Configuration Module non volatile memory at the time of installation.
This module is mounted behind the NCU rack, to allow NCU replacement without requiring the re-initialization.
Configuration data can be accessed through the FPCDU but their modification is restricted.

The NCU processes (Kalman filtering) the position data received from all available selected sensors (including its internal GPS receiver) and determines the Best Computed Position (BCP).
A sensor "watchdog" feature, also accomplished by NCU, consists of continuously monitoring the difference between each sensor's position assessment and the BCP.
If this difference exceeds a preset value the erratic sensor is automatically deselected to avoid BCP contamination and a proper message is generated to warn the operator.
The GPS portion of the NCU, conforming to the TSO C-129a Class A1, B1 and C1, implements a predictive Receiver Autonomous Integrity Monitoring (RAIM) function which supports the use of GPS for enroute, terminal and approach operations.

A strut switch input to the NCU causes all available sensors to be automatically selected as the airplane lifts off and determines their deselection with automatic position hold at touchdown.
Manual selection/deselection of individual sensors is however allowed both on ground and airborne.
The strut switch information is overridden as the true airspeed exceeds 150 Kts.

Based on the BCP, the FMS allows navigation along the pilot programmed flight path which can include Standard Instrument Departure procedures (SIDs), airways, predefined search patterns (Orbit, Rising Ladder, Sector Search, Border Patrol, Race Track, Expanding Square), holding procedures, Standard Terminal Approach Route procedures (STARs), approaches and runways.
The BCP is then used to provide all secondary navigation functions such as course, bearing, desired track, distance, estimated time enroute (ETE), estimated time of arrival (ETA), wind, ground speed, etc..

Using its internal data base the NCU automatically scans all available DMEs by using the DME-42 blind channel (without any interference with the pilot's controlled DME channels).
Information from the scanned DME stations are presented both on the FPCDU DME page and on EFIS (Extended Data). The computed rho-rho position is not used to update any sensor position, but tracked separately and blended into the BCP.

Bearing information from VOR is used if only one DME is available or during RNAV approaches.
Tuning of the VOR (VIR-32) or TACAN (if installed) is also provided by the NCU (directly or via the FPCDU).

If the CRS selector on the EFIS Display Select Panel is positioned to LNAV, all navigation information from the FMS is displayed on EFIS Electronic HSI (EHSI) and Multifunction Display (MFD). In such condition, deviation signals from the FMS are routed by EFIS processors to the Autopilot computer.
If NAV mode is selected on the Autopilot Controller, this information is then used either to drive the ADIs "V-Bars" (Flight Director Mode, with A/P disengaged) or to generate servo commands for automatic aircraft control (Autopilot Engaged Mode).

The deviation signals generated by the NCU for autopilot/flight director coupled operations are related to the steering limits versus altitude established by the pilot (see Operator's Manual).
The NCU calculates the circular arc to turn on course and provides a wings level rollout with the aircraft heading directly towards the next waypoint.

The FMS heading mode allows the pilot to command the Autopilot/Flight Guidance Computer to fly a selected heading without the need of dropping the A/P NAV mode and selecting the A/P HDG mode.
The selected heading can be entered either via the FPCDU keyboard or via EFIS DSP heading bug and is displayed on both EFIS (with a special symbol) and FPCDU. This function can be used both to fly a selected heading and to intercept the current navigation leg or the approach inbound course. In the latter case the FMS HDG is dropped as the leg is intercepted.
During A/P coupled operations the activation of this mode causes FHDG1 autopilot mode annunciation (green) to replace FMS1 (green) on the EFIS EADI.

If the approach mode is activated on the FPCDU (only within about 50.0 nautical miles from the designated pilot defined end-of-approach point), the FMS, as installed on the P.180, provides lateral deviation signals and APPR annunciation for display on EFIS EADI and EHSI (2D approach), in addition to APPR remote annunciation.

WARNING

During Flight Director or Autopilot operations, when the Approach mode is activated on the FMS:
- APR must not be selected on the autopilot controller;
- Only NAV may be selected on the autopilot controller.

In the above condition, selection of APR on the autopilot controller will result in an erroneous response from either the flight director or the autopilot even though normal operating conditions are annunciated.

If the NAV mode is selected on the Autopilot Controller too, autopilot/flight director coupled 2D approaches to any runway are allowed.

The FMS provides IFR guidance (2D only in the P.180) for VOR/DME, VOR, TACAN (if installed), NDB, GPS and GPS overlay NDB approaches, in addition to conventional RNAV approaches, for any published non-precision IFR approach and allows FMS-enhanced VFR approaches as well.

The minimum operational sensors when flying a VOR/DME or RNAV approach are the VOR and DME from the referenced navaid.
Other DME distances and information from other sensors (which meet the accuracy requirements) are used for position cross check and determine the approach mode to be canceled if a navigation accuracy degradation were detected.
For VOR approaches the VOR signals must be received from the referenced navaid as well as DME data from available facilities.
FMS enhanced VFR approaches can be flown using any combination of available sensors (that is the BCP) with no reference navaid required provided the BCP Q factor is lower than 28.
Air data and heading are required for every approach type.

The FMS also provides EFIS processors with vertical navigation (VNAV) information according pilot defined vertical flight path (waypoints altitude and target vertical speed) for display on EADI and EHSI during the enroute phase of flight (vertical deviation scale on the right side of the instruments with cross-shaped pointer).
In the P.180 installation VNAV information is advisory only and cannot be coupled to the autopilot/flight director.
Whenever the FMS approach mode is activated, the FMS VNAV mode is canceled and vertical deviation scale is removed from view.

Fuel Management is provided as a "stand-alone" function based on manual data entering (gross weight, fuel quantity, engines fuel flow, etc.) and display of information on the FPCDU only.

The NCU contains a non volatile memory (powered by a lithium battery hard soldered to the CPU board of the NCU: being an on condition unit no scheduled maintenance or testing is required. Should a battery degradation occur, a FMC BATT LOW message will be displayed on the FPCDU: in this event the NCU must be serviced at an Universal Avionics System Corp. authorized facility) where is stored the internal data base containing worldwide or regional airports, navaids, airways (high and low altitude), intersections, enroute waypoints, terminal waypoints, SIDs, STARs, approaches and pilot defined data (waypoints, routes, runways, SIDs, STARs and approaches).

The Data Transfer Unit (portable) is a 3.5" floppy disk drive housed within a protective case that can be connected to the system via the connector on the right side of the pedestal (nearby the floor).
DTU functions include periodical updating of Jeppesen Data Base, loading of pilot defined data (such as flight plans and check lists created with a compatible off-line flight planning software on a personal computer), Pilot Data Base saving, loading of airplane specific performance data, data recording.

In order to allow data loading into FMS before engine starting, the FMS can be powered with only the airplane BATTERY switch set to ON, while the airplane AVIONICS master switch is OFF. This condition allows connecting the portable DTU while the other avionics systems are not powered for battery saving.

CAUTION

The FMS must be switched OFF before the Engine starting procedure is initiated in order to avoid possible system damaging.

The GPS antenna is a low-profile type with a built-in pre-amplifier located on the top of the fuselage.

The NCU and the DTU (if plugged in) are powered by the +28VDC RH Avionics Bus via the LRN-PWR (5A) and FPCDU PWR (3A) circuit breakers respectively (all located on the COPILOT CB PANEL). Power to the FPCDU is provided by the NCU.
The 400 Hz for reference is supplied (through the 1A LRN fuse) by the 26VAC Primary Bus located inside the AC Control Unit which is mounted in the nose.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic handling, service and maintenance instructions provided by Section 8 of the Pilot's Operating Handbook are necessary for this Supplement.

PILOT'S OPERATING HANDBOOK AND ENAC APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 31 FOR STEEP APPROACH OPERATIONS

(Mod. N. 80-0563)

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when conducting Steep Approach operations (as per Mod. N. 80-0563).
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The approval of this Supplement does not constitute operational approval to conduct Steep Approach operations.

ABBREVIATIONS

AGL	Above Ground Level
DA	Decision Altitude (Precision Approaches)
MDA	Minimum Descent Altitude (Non Precision Approaches)

SECTION 2 – LIMITATIONS

The following limitations apply to the P-180 airplane when conducting Steep Approach operations:

a.	Max Approach Gradient (FULL FLAP)	15.8% (9°)
b.	Max Approach Gradient (MID FLAP)	12% (7°)
c.	Max Crosswind	25 KTS
d.	Max Tail Wind	10 KTS
e.	Minimum altitude for Autopilot operation	400 feet AGL
f.	Minimum ILS guidance intercept	1800 feet AGL
g.	Minimum go-around altitude	400 feet AGL
h.	Deliberate Single Engine Approaches are prohibited.	

KIND OF OPERATION

a. The aircraft is approved for flown steep approaches in visual or instrument meteorological conditions. A glide path reference system is required in case of IFR conditions.
b. This Supplement does not constitute operational approval to conduct Steep Approach operations.

SECTION 3 – EMERGENCY PROCEDURES

No changes to the basic emergency procedures provided by Section 3 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 4 – NORMAL PROCEDURES

LANDING

WARNING

- Deliberate single engine approaches are not allowed.
  If engine failure occurs during a steep approach, after final descent but before MDA, or DA, make a GO AROUND and proceed to the alternate airport.
  If it occurs below MDA, or DA, continue and land.

- In case of Flap System mulfunction it is necessary to proceed to the alternate airport.

CAUTION

Minimum altitude for initiating a go-around is 400 feet AGL or the airfield approach minimum, whichever is higher.

a. The airplane must be in the appropriate flaps and landing gear configuration before glide intercept at the appropriate approach speed.

CAUTION

Configuration changes during approach may result in excessive path deviation requiring a go around.

b. Stabilize the airplane at high rate of descent in final configuration with the aid of a suitable glide path reference system, if available. In case an external aid is not available the glide path angle can be controlled through the vertical speed indicator according to the following table:

	KIAS	R/D at 3° glide slope (ft/min)	R/D at 5° glide slope (ft/min)	R/D at 7° glide slope (ft/min)	R/D at 9° glide slope (ft/min)
0 Wind	117	620	1030	1440	1850
	121	640	1070	1490	1920
	125	660	1100	1540	1980
	129	680	1140	1590	2050
	131	694	1156	1616	2075
10 KTS Tail Wind	117	670	1120	1570	2010
	121	690	1160	1620	2075
	125	715	1190	1670	2140
	129	740	1230	1715	2200
	131	750	1240	1740	2230
10 KTS Head Wind	117	570	940	1320	1690
	121	590	980	1370	1760
	125	610	1015	1420	1820
	129	630	1050	1470	1885
	131	640	1068	1490	1920
20 KTS Head Wind	117	510	860	1200	1540
	121	535	890	1250	1600
	125	560	930	1300	1660
	129	580	960	1345	1730
	131	590	980	1370	1760

Note: These values are valid in ISA sea level conditions. For airport altitude higher than sea level the rate of descent should be increased of 1.5% every 1000 ft of airport altitude.

If the distance from the glide slope is available the following chart could be used in order to plan the descent:

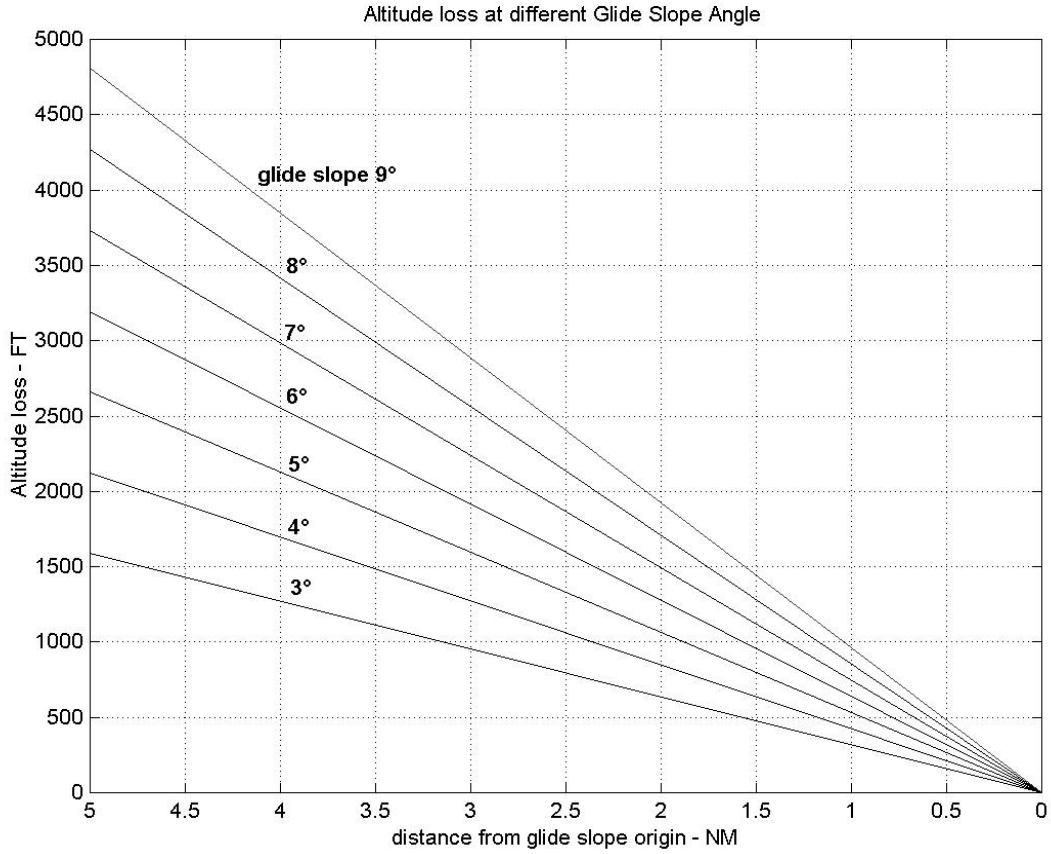

Figure 9-52. ALTITUDE LOSS AT DIFFERENT GLIDE SLOPE ANGLE

c. Adjust engine power before flare, as required.
d. Flare out of high rate of descent.
e. After touch-down basic normal procedures are applicable.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 6 – WEIGHT AND BALANCE

No changes to the basic Weight and Balance provided by Section 6 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 7 – DESCRIPTION AND OPERATION

No changes to the basic Description and Operation provided by Section 7 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic handling, service and maintenance instructions provided by Section 8 of the Pilot's Operating Handbook are necessary for this Supplement.

PILOT'S OPERATING HANDBOOK AND ENAC APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 32 FOR FLIGHT ENVELOPE EXTENSION - MACH 0.7

(Mod. 80-0407)

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Mach 0.7 Optional Kit 80KA00072 is installed, or when the Piaggio Service Bulletin SB-80-0159 has been introduced, on the airplane.
The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

SECTION 2 – LIMITATIONS

AIRSPEED LIMITATIONS

SPEED	KCAS	KIAS
MAXIMUM OPERATING SPEED LIMIT – V_{MO}/M_{MO} Do not exceed this airspeed in any operation. (See Figure 9-53 on page 9-352)	258/.695 Mach	260/.70 Mach

AIRSPEED INDICATOR MARKINGS

MARKING	SIGNIFICANCE	KIAS
Red Line	Maximum Operating Speed	260
Red and White Stripes Pointer	Maximum Operating Mach Number	.70
Red Line	Air Minimum Control Speed	100
White Arc	Full flap operating range Lower limit is maximum weight stalling speed in landing configuration. Upper limit is maximum speed permissible for operating flaps in landing configuration.	98 to 150
Blue Line	One Engine Inoperative Best Rate of Climb Speed	140

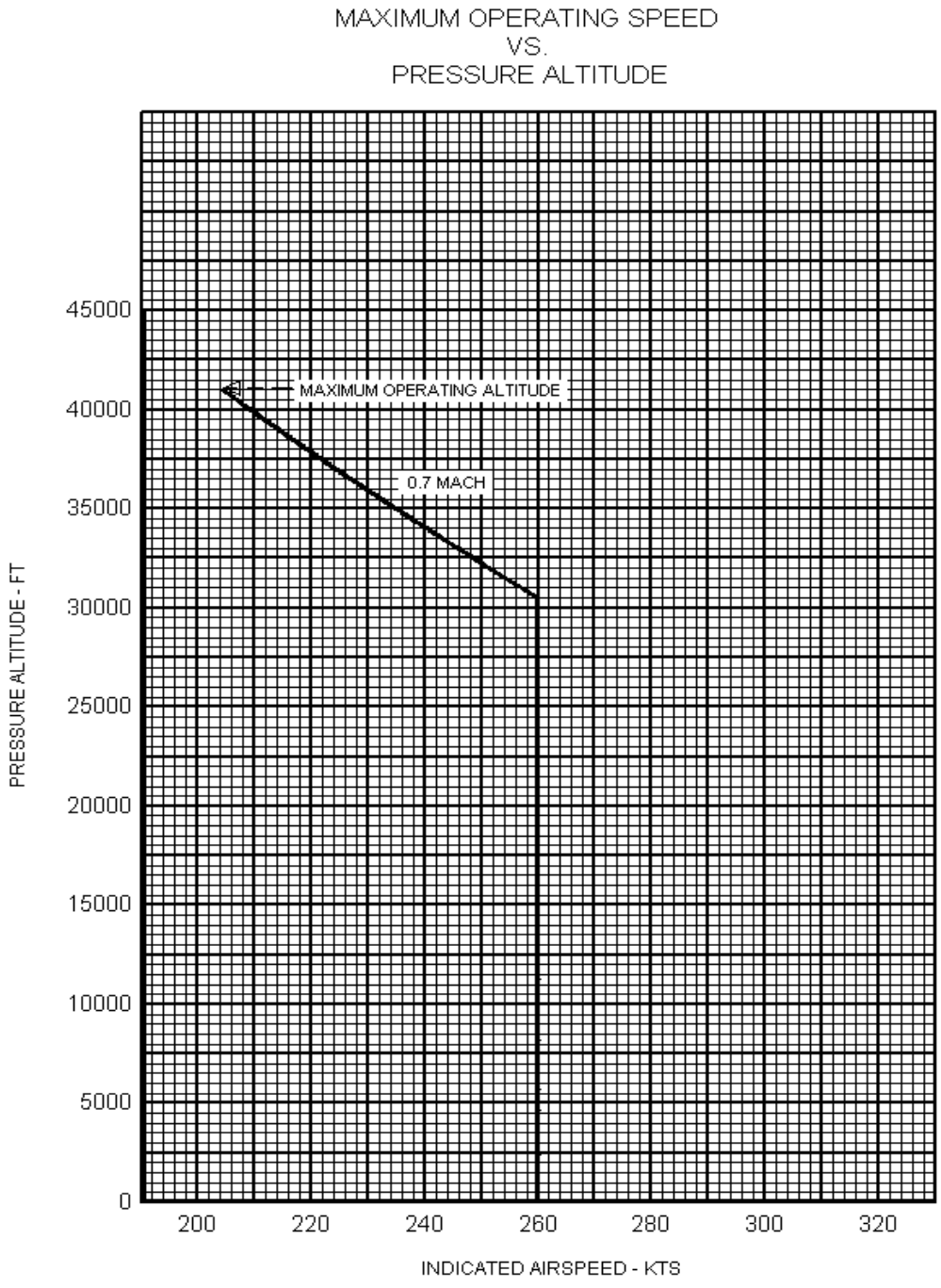

Figure 9-53. MAXIMUM OPERATING SPEED

SECTION 3 – EMERGENCY PROCEDURES

No changes to the basic emergency procedures provided by Section 3 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 4 – NORMAL PROCEDURES

No changes to the basic normal procedures provided by Section 4 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 6 – WEIGHT AND BALANCE

EQUIPMENT LIST

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the airplane is equipped for flight envelope extension to Mach 0.7.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-10	FLIGHT ENVIRONMENT DATA					
	M_{MO}=0.7 KIT EQUIPMENT					
	- Mach/Airspeed Indicator, Copilot Thommen 5C15.42.35K.05.1.BF	2.00	17.50	0.35	1	

SECTION 7 – DESCRIPTION AND OPERATION

The flight envelope extension to Mach 0.7 requires the installation on the copilot instrument panel of a Mach Airspeed indicator with the red line indicating the Maximum Operating Mach Number (M_{MO} limit) as illustrated in the figure below.

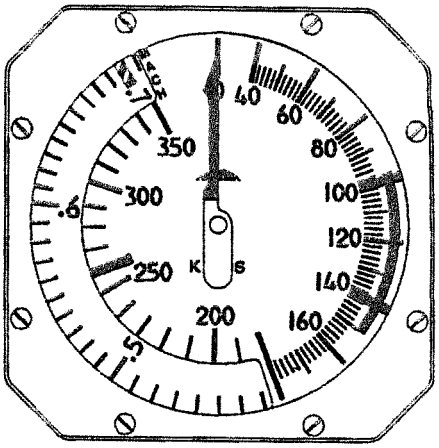

Figure 9-54. MACH SPEED INDICATOR (COPILOT)

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic handling, service and maintenance instructions provided by Section 8 of the Pilot's Operating Handbook are necessary for this Supplement.

PILOT'S OPERATING HANDBOOK AND ENAC APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 33 FOR THE AIR AMBULANCE CONFIGURATION (OPTIONS #20 AND #21)

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Air Ambulance Kit 80KI00020 (Option #20 cabin configuration) or 80KI00021 (Option #21 cabin configuration) is installed.

The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein.
For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

ABBREVIATIONS

BLS	Basic Life Support
PLUS	Patient Loading and Utility System

SECTION 2 – LIMITATIONS

CAUTION

Use of any equipment connected to the BLS must be approved by the National Aviation Autority. Compliance with FAA AC 135-15 is considered acceptable.

WEIGHT LIMITS

1. The following weight limitations apply to the Opt. #20 and #21 Cabinets and Cabin Baggage Compartment:
   a. Maximum weight in Cabin Baggage Compartment 110 lbs (49,8 kg)
   b. Maximum weight in Right Side Rear Cabinet 22 lbs (10,0 kg)
   c. Maximum weight in Left Side Rear Cabinet 61,6 lbs (28,0 kg)
2. Electromedical equipment can be installed on each TS Side Arch (P/N 100-4279-CF2-002) and TS Arch (P/N 100-4123-02-CF2-002) with the following weight limitations:
   a. Maximum load on TS Side Arch 25 lbs (11,3 kg)
   b. Maximum load on TS Side Arch (Taxi, Takeoff and Landing) 15 lbs (6,8 kg)
   c. Maximum load on TS Arch 50 lbs (22,7 kg)
3. A maximum of two 10 lt. oxygen bottles can be installed inside each 6' PLUS and one on the oxygen vessel rack near the LH rear cabinet with the following weight limitation:
   a. Oxygen bottle (completely filled) maximum weight 44 lbs (20 kg)

SEATING/LITTER LIMITS

CAUTION

Patients and stretchers shall be installed so that the patient's head is in forward position.
The stretcher backrest must be in the fully lowered position during taxi, take-off and landing.

CREW LIMITS

In addition to the normal flight crew limits, a minimum of one attendant for each stretcher occupant who is incapable of independently exiting the airplane.

NOTE

The attendant/medical personnel should be familiarized with the use of the medical equipment installed.

PIAGGIO AERO

PLACARDS

1. On the Cabin Baggage Compartment:

   In the upper bay:

   WEIGHT CAPACITY 13.6 kg / 30 Lbs MAX

   In the middle bay:

   WEIGHT CAPACITY 20.4 kg / 45 Lbs MAX

   In the lower bay:

   WEIGHT CAPACITY 15.8 kg / 35 Lbs MAX

2. On the Left Side Rear Cabinet:

   Above the drawers:

   ALL DRAWERS MUST BE CLOSED WHEN NOT IN USE

   On the first upper drawer:

   WEIGHT CAPACITY 2 kg / 4.4 Lbs MAX

   On the second drawer:

   WEIGHT CAPACITY 3 kg / 6.6 Lbs MAX

   On each of the two lower drawers:

   WEIGHT CAPACITY 0.5 kg / 1.1 Lbs MAX

   In the lower bay:

   WEIGHT CAPACITY 20 kg / 44 Lbs MAX

   Inside each bay of the lateral compartment:

   WEIGHT CAPACITY 0.5 kg / 1.1 Lbs MAX

   Above the Oxygen vessel rack:

   OXYGEN VESSEL MUST BE SECURED

On the Oxygen vessel rack:

WEIGHT CAPACITY 20 kg / 44 Lbs MAX

3. On the Right Side Rear Cabinet:

On the upper drawer:

WEIGHT CAPACITY 6 kg / 13.2 Lbs MAX

On the lower drawer:

WEIGHT CAPACITY 4 kg / 8.8 Lbs MAX

4. On top of the small foldable table (when closed):

PUSH TO OPEN

5. On the 2' PLUS Unit:

40 LBS (18 KG) MAX
DOOR MUST BE LATCHED DURING TAXI, TAKEOFF AND LANDING
DO NOT USE AS A SEAT DURING TAXI, TAKE-OFF OR LANDING

6. Near the 2' PLUS Unit:

THIS SEAT MUST NOT BE OCCUPIED
DURING TAKE OFF AND LANDING

7. On each 6' PLUS Unit:

On the upper area:

EMERGENCY SLED RELEASE
PUSH IN, TILT SLED OUT
PUSH

On the system control panel:

AIR
SUCTION
PNL LTS
230 VAC
CONV
12 VDC
OXYGEN
AIR
SUCTION
230 VAC
1,4 AMPS TOTAL

On both lateral sides:

REMOVE HANDLES BEFORE FLIGHT

On the load bay door panels:

OXYGEN SHUTOFF INBOARD & OUTBOARD
CLOCK-WISE OFF
HIGH PRESSURE OXYGEN
FILL 200 BAR MAX
CAUTION USE NO OIL
NO SMOKING
BACKREST IN LOWEST POSITION FOR TAXI, TAKE-OFF AND LANDING
ENSURE LIFELOCKS ARE FULLY ENGAGED BEFORE FLIGHT
NO STORAGE ALLOWED WITH OXYGEN BOTTLE INSTALLED

Inside the load bay on the oxygen shutoff panel:

INBOARD
OFF
OUTBOARD
OXYGEN

On the rear side:

OXYGEN
AIR
SUCTION
LOW PSI OXYGEN
CLOSE VALVE BEFORE DISCONNECTING
HIGH PSI OXYGEN
CLOSE VALVE BEFORE DISCONNECTING
INV REMOTE
LIGHTS 28 VDC

8. On each Side Arch:

On the leg:

**TOTAL LOAD OF 25 LBS MAXIMUM INSTALLED ON THE ARCH HEAD EXTRUSION.
15 LBS FOR TAXI, TAKEOFF AND LANDING. THE CENTER OF GRAVITY MUST NOT BE MORE THAN 4" INBOARD AND ABOVE THE UPPER SURFACE.**

On the box:

12 VDC
230 VAC
AIR
OXYGEN

9. On the TS arch:

**50 LBS MAXIMUM.
THE CENTER OF GRAVITY MUST NOT BE MORE THAN 2" ABOVE THE UPPER SURFACE.
CAUTION: IT IS THE RESPONSIBILITY OF THE OPERATOR TO ENSURE THE AIRWORTHINESS OF ANY LOAD OR EQUIPMENT MOUNTED ON THIS ARCH INCLUDING EMI, RMI, FLAMMABILITY EMERGENCY EGRESS, STRUCTURAL INTEGRITY OR ANY OTHER POTENTIAL HAZARD.**

SECTION 3 – EMERGENCY PROCEDURES

EVACUATION OF NON-AMBULATORY PATIENTS

In the event of an emergency evacuation, the attendant/medical personnel required at Section 2 "Limitations" of this Supplement is responsible for evacuating the non-ambulatory stretcher occupants.

EVACUATION VIA CABIN DOOR

1. Open cabin door.
2. Prepare each patient for evacuation.
3. Remove each patient from the stretcher.
4. Drag each patient by lifting under both arms and backing through the door.

EVACUATION VIA EMERGENCY EXIT DOOR

1. Open emergency exit door.
2. Prepare each patient for evacuation.
3. Allow pilot exit first.
4. Remove each patient from the stretcher.
5. Drag each patient by lifting under both arms and backing towards the emergency exit.
6. Put the patient leg through the emergency exit.
7. Lift the patient and allow sliding through the emergency exit.
8. The pilot lowers the patient to the ground.

IN THE EVENT OF EXCESSIVE ELECTRICAL LOAD

1. Pilot informs attendant/medical personnel and request for a BLS electrical load reduction.
2. Reduce electrical load.
3. Monitor electrical load.

If excessive electrical load continues:

4. Pilot informs attendant/medical personnel and request to switch off all electrical loads.

IN THE EVENT OF DUAL GENERATOR FAILURE

1. Pilot informs attendant/medical personnel of a zero electrical power situation and request to switch off all electrical loads.

IN THE EVENT OF LITTER BREAKER TRIPPED

1. Push to reset the circuit breaker.
2. If the circuit breaker trips again do not reset until the cause of the circuit malfunction is determined and corrected.

SECTION 4 – NORMAL PROCEDURES

PREFLIGHT CHECK

Referring to the Air Ambulance interior configuration approved by the National Aviation Authority, the operator must verify the correct location of the interior components.
Slide Aerosled on the BLS base until fastening pins engage the latches. Check the correct engagement of all the four pins: trying to rock the stretcher from each end is an acceptable checking method. Stretchers occupants must be head forward oriented in the airplane.
Each stretcher occupant shall be secured by means of the restraint harness during taxi, takeoff and landing operations.

Each restraint harness is installed as required to fit each individual occupant. The shoulder straps are passed over the occupant shoulders and fastened through the buckle of the torso belt. The thigh belt is secured over the lover limbs of the occupant.

Check the electromedical equipment are positively secured and related supporting frame properly fastened. Check the electrical cables for correct connection to the BLS power sockets and to the electromedical equipment rack sockets.

CAUTION

The installed medical equipment, as approved by the National Aviation Authority, should be checked operative as per the proper applicable operator's manuals.

NOTE

Primary airplane electrical loads shall take precedence on medical system loads when an electrical load shedding is required.

SECTION 5 – PERFORMANCE

No changes to the basic performances provided by Section 5 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this supplement.

SECTION 6 – WEIGHT AND BALANCE

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the airplane is arranged in the Air Ambulance Configuration.
The operator must ensure the airplane is loaded within the Weight, Moment and Center of Gravity limits envelope at Section 6 of the basic Manual.

OCCUPANTS

OPTION # 20 CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 96.25 IN	LITTER 2 ARM 133.44 IN	SEAT 3 ARM 129.36 IN	SEAT 4 ARM 187.95 IN	SEAT 5 ARM 165.36 IN	SEAT 6 ARM 218.18 IN
MOMENT (LBS * IN/100)							
100	49.20	96.25	133.44	129.36	187.95	165.36	218.18
110	54.12	105.88	146.78	142.30	206.75	181.90	240.00
120	59.04	115.50	160.13	155.23	225.54	198.43	261.82
130	63.96	125.13	173.47	168.17	244.34	214.97	283.63
140	68.88	134.75	186.82	181.10	263.13	231.50	305.45
150	73.80	144.38	200.16	194.04	281.93	248.04	327.27
160	78.72	154.00	213.50	206.98	300.72	264.58	349.09
170	83.64	163.63	226.85	219.91	319.52	281.11	370.91
180	88.56	173.25	240.19	232.85	338.31	297.65	392.72
190	93.48	182.88	253.54	245.78	357.11	314.18	414.54
200	98.40	192.50	266.88	258.72	375.90	330.72	436.36
210	103.32	202.13	280.22	271.66	394.70	347.26	458.18
220	108.24	211.75	293.57	284.59	413.49	363.79	480.00

NOTE

Seat 6 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.

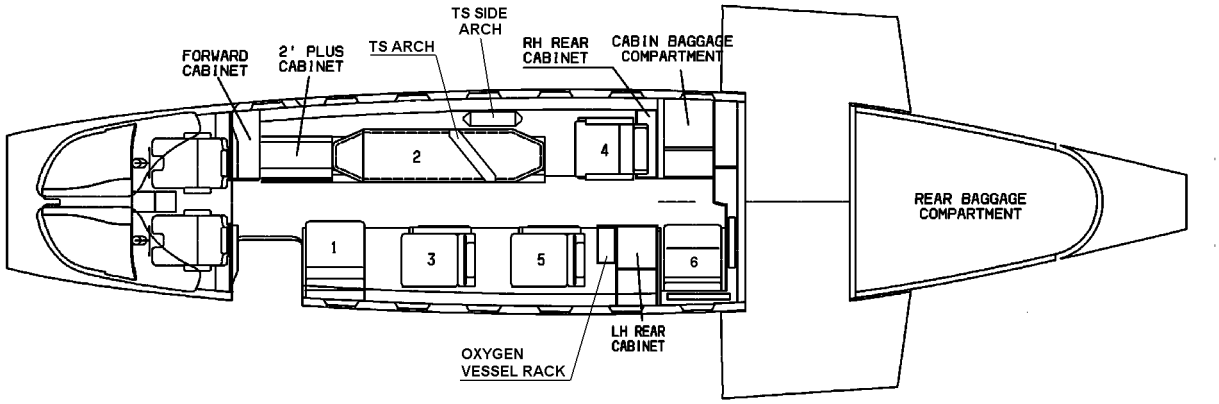

Figure 9-55. LOADING CHART - OCCUPANTS - OPT. # 20

BAGGAGE (OPTION # 20 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPT. FS 275 TO 320 ARM 298 IN.
	MOMENT (LBS*IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPT. FS 208 TO 232 ARM 220 IN.
	MOMENT (LBS*IN/100)
10	22.00
20	44.00
30	66.00
40	88.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00
100	220.00
110	242.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN.
	MOMENT (LBS*IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	2' PLUS CABINET FS 71 TO 95 ARM 83.2 IN.
	MOMENT (LBS*IN/100)
5	4.16
10	8.32
15	12.48
20	16.64
25	20.80
30	24.96
35	29.12
40	33.28

WEIGHT (*) LBS	6' PLUS STOWAGE COMPT. ARM 131.2 IN.
	MOMENT (LBS*IN/100)
5	6.56
10	13.12
15	19.68
20	26.24

WEIGHT LBS	LEFT SIDE REAR CABINET FS 192 TO 206 ARM 197 IN.
	MOMENT (LBS*IN/100)
5	9.85
10	19.70
15	29.55
20	39.40
25	49.25
30	59.10
35	68.95
40	78.80
45	88.65
50	98.50
55	108.35
60	118.20

WEIGHT LBS	RIGHT SIDE REAR CABINET FS 198 TO 206 ARM 200 IN.
	MOMENT (LBS*IN/100)
5	10.00
10	20.00
15	30.00
20	40.00
22	44.00

(*) Payload when no oxygen bottle is installed inside the stowage compartment.

Figure 9-56. LOADING CHART - BAGGAGE - OPT. # 20

OCCUPANTS

OPTION # 21 CABIN CONFIGURATION

WEIGHT LBS	CREW SEATS ARM 49.20 IN	SEAT 1 ARM 96.25 IN	LITTER 2 ARM 133.44 IN	LITTER 3 ARM 150.00 IN	SEAT 4 ARM 187.95 IN	SEAT 5 ARM 218.18 IN
MOMENT (LBS * IN/100)						
100	49.20	96.25	133.44	150.00	187.95	218.18
110	54.12	105.88	146.78	165.00	206.75	240.00
120	59.04	115.50	160.13	180.00	225.54	261.82
130	63.96	125.13	173.47	195.00	244.34	283.63
140	68.88	134.75	186.82	210.00	263.13	305.45
150	73.80	144.38	200.16	225.00	281.93	327.27
160	78.72	154.00	213.50	240.00	300.72	349.09
170	83.64	163.63	226.85	255.00	319.52	370.91
180	88.56	173.25	240.19	270.00	338.31	392.72
190	93.48	182.88	253.54	285.00	357.11	414.54
200	98.40	192.50	266.88	300.00	375.90	436.36
210	103.32	202.13	280.22	315.00	394.70	458.18
220	108.24	211.75	293.57	330.00	413.49	480.00

NOTE

Seat 5 can be occupied during takeoff or landing only if the optional belted lavatory seat is installed.

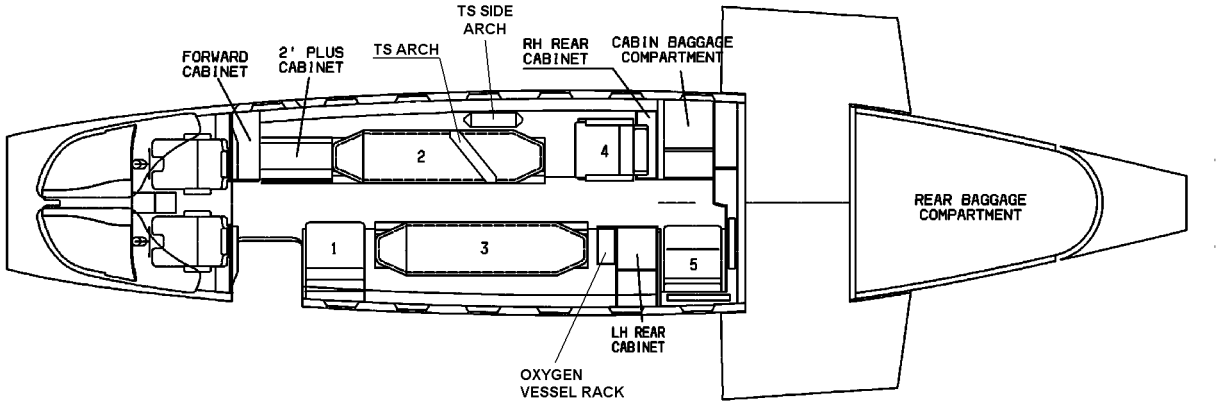

Figure 9-57. LOADING CHART - OCCUPANTS - OPT. # 21

BAGGAGE (OPTION # 21 CABIN CONFIGURATION)

WEIGHT LBS	REAR BAGGAGE COMPT. FS 275 TO 320 ARM 298 IN.
	MOMENT (LBS*IN/100)
10	29.80
20	59.60
30	89.40
40	119.20
50	149.00
60	178.80
70	208.60
80	238.40
90	268.20
100	298.00
110	327.80
120	357.60
130	387.40
140	417.20
150	447.00
160	476.80
170	506.60
180	536.40
190	566.20
200	596.00
210	625.80
220	655.60
230	685.40
240	715.20
250	745.00
260	774.80
270	804.60
280	834.40
290	864.20
300	894.00
310	923.80
320	953.60
330	983.40
340	1013.20
350	1043.00
360	1072.80
370	1102.60
380	1132.40
390	1162.20
400	1192.00

WEIGHT LBS	CABIN BAGGAGE COMPT. FS 208 TO 232 ARM 220 IN.
	MOMENT (LBS*IN/100)
10	22.00
20	44.00
30	66.00
40	88.00
50	110.00
60	132.00
70	154.00
80	176.00
90	198.00
100	220.00
110	242.00

WEIGHT LBS	RIGHT SIDE REAR CABINET FS 198 TO 206 ARM 200 IN.
	MOMENT (LBS*IN/100)
5	10.00
10	20.00
15	30.00
20	40.00
22	44.00

WEIGHT LBS	FORWARD CABINET FS 55 TO 70 ARM 62.5 IN.
	MOMENT (LBS*IN/100)
5	3.13
10	6.25
15	9.38
20	12.50
25	15.63
30	18.75
34	21.25

WEIGHT LBS	2' PLUS CABINET FS 71 TO 95 ARM 83.2 IN.
	MOMENT (LBS*IN/100)
5	4.16
10	8.32
15	12.48
20	16.64
25	20.80
30	24.96
35	29.12
40	33.28

WEIGHT (*) LBS	6' PLUS STOWAGE COMPT. (RH) ARM 131.2 IN.
	MOMENT (LBS*IN/100)
5	6.56
10	13.12
15	19.68
20	26.24

WEIGHT (*) LBS	6' PLUS STOWAGE COMPT. (LH) ARM 144.8 IN.
	MOMENT (LBS*IN/100)
5	7.24
10	14.48
15	21.72
20	28.96

WEIGHT LBS	LEFT SIDE REAR CABINET FS 192 TO 206 ARM 197 IN.
	MOMENT (LBS*IN/100)
5	9.85
10	19.70
15	29.55
20	39.40
25	49.25
30	59.10
35	68.95
40	78.80
45	88.65
50	98.50
55	108.35
60	118.20

(*) Payload when no oxygen bottle is installed inside the stowage compartment.

Figure 9-58. LOADING CHART - BAGGAGE - OPT. # 21

PIAGGIO AERO

EQUIPMENT LIST

The following items, not included in the weight and balance information presented in Section 6 of the basic Pilot's Operating Handbook, must be considered integral part of the Equipment List when the airplane is arranged in the AIR AMBULANCE Configuration (Options # 20 or # 21).

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25	**EQUIPMENT/FURNISHINGS**					
25-20	PASSENGER COMPARTMENT					
	OPTION # 20 CABIN CONFIGURATION					
	- 2' PLUS Unit (1) LifePort Inc. 100-4568-CF2-002	28.52	83.20	23.73	1	
	- Side facing seat GEVEN AV11-3521-00	28.70	96.25	27.62	1	
	- 6' PLUS Unit (1) LifePort Inc. 366-4300-CF2-002	125.30	129.20	161.89	1	
	- Aerosled TS Side Arch LifePort Inc. 100-4279-CF2-002	25.00	151.00	37.75	1	
	- Aerosled TS Stretcher LifePort Inc. 100-4065-CF2-002	36.60	133.44	48.84	1	
	with					
	- Aerosled TS Arch LifePort Inc. 100-4049-CF2-002	4.85	139.00	6.74	1	
	or					
	- Aerosled TD Strecher LifePort Inc. 100-4123-02-CF2-002	35.00	133.44	46.70	1	
	- FWD Facing Seat (LH) ERDA 303453-4	47.80	129.36	61.83	1	
	- FWD Facing Seat (LH) ERDA 303453-4	47.80	165.36	79.04	1	
	- FWD Facing Seat (RH) GEVEN AV03-2113-02	30.10	187.95	56.57	1	
	- Rear Cabinet, LH side (2) Piaggio 80-909820-803	41.88	197.00	82.50	1	
	- Cabin Baggage Compartment (3) Piaggio 80-909942-801	50.70	220.00	111.54	1	
	(1) Mounting plates weight included. (2) Includes Rear Cabinet assy P/N 80-909818-803 and Rear Cabinet support assy P/N 80-909946-801. (3) Includes Cabinet assy P/N 80-909943-801.					

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT					
	OPTION # 20 CABIN CONFIGURATION (cont.)					
	- Rear Cabinet, RH side LifePort Inc. 180-2360-CF2-02	20.80	200.00	41.60	1	
	- Oxygen Vessel Rack Piaggio 80-909947-801	5.40	187.47	10.12	1	
	- Loading Ramp LifePort Inc. 100-4472	33.00	298.00	98.34	1	
	OPTION # 21 CABIN CONFIGURATION					
	- 2' PLUS Unit (1) LifePort Inc. 100-4568-CF2-002	28.52	83.20	23.73	1	
	- Side facing seat GEVEN AV11-3521-00	28.70	96.25	27.62	1	
	- 6' PLUS Unit (RH) (1) LifePort Inc. 366-4300-CF2-002	125.30	129.20	161.89	1	
	- Aerosled TS Side Arch (RH) LifePort Inc. 100-4279-CF2-002	25.00	151.00	37.75	1	
	- Aerosled TS Stretcher (RH) LifePort Inc. 100-4065-CF2-002 with	36.60	133.44	48.84	1	
	- Aerosled TS Arch LifePort Inc. 100-4049-CF2-002	4.85	139.00	6.74	1	
	or					
	- Aerosled TD Strecher (RH) LifePort Inc. 100-4123-02-CF2-002	35.00	133.44	46.70	1	
	- 6' PLUS Unit (LH) (1) LifePort Inc. 366-4300-CF2-002	125.30	152.76	191.41	1	
	- Aerosled TS Stretcher (LH) LifePort Inc. 100-4065-CF2-002 with	36.60	150.00	54.90	1	
	or					
	- Aerosled TD Strecher (LH) LifePort Inc. 100-4123-02-CF2-002	35.00	150.00	52.50	1	
	(1) Mounting plates weight included.					

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
25-20	PASSENGER COMPARTMENT					
	OPTION # 21 CABIN CONFIGURATION (cont.)					
	- FWD Facing Seat GEVEN AV03-2113-02	30.10	187.95	56.57	1	
	- Rear Cabinet, LH side (2) Piaggio 80-909820-803	41.88	197.00	82.50	1	
	- Cabin Baggage Compartment (3) Piaggio 80-909942-801	50.70	220.00	111.54	1	
	- Rear Cabinet, RH side LifePort Inc. 180-2360-CF2-02	20.80	200.00	41.60	1	
	- Oxygen Vessel Rack Piaggio 80-909947-801	5.40	187.47	10.12	1	
	- Loading Ramp LifePort Inc. 100-4472	33.00	298.00	98.34	1	
	(2) Includes Rear Cabinet assy P/N 80-909818-803 and Rear Cabinet support assy P/N 80-909946-801. (3) Includes Cabinet assy P/N 80-909943-801.					

SECTION 7 – DESCRIPTION AND OPERATION

A flush-mounted socket on each side of the cabin floor provides electrical power supply to each litter assembly. Suitable access panels are provided for the floor sockets protection when the litter assemblies are not installed.
Two 50-ampere circuit breakers are installed in the main junction box for protection of the feeding lines to the litter assemblies: one on the left generator bus for the left litter assembly and the other one on the right generator bus for right litter assembly.
For pilot's control of electrical power delivery to each litter assembly during all flight operations, two remotely controlled circuit breakers are installed in the main junction box with the respective control circuit breakers located on the copilot circuit breaker panel, placarded respectively AUX1 for the left and AUX2 for the right litter assembly (see Fig. 9-59).

WARNING

Each time a litter assembly is to be either connected to or disconnected from the airplane electrical power supply, be sure the battery is OFF before the litter electrical plug is engaged in/disengaged from the airplane power connector.

The Air Ambulance configuration, option # 20, consists of one BLS system, one patient load ramp, one side-facing seat, three forward-facing seat, one forward cabinet, two rearward cabinets and an oxygen vessel rack. Individual lifejacket stowage compartments are provided.

In the Air Ambulance configuration, option # 21, the two forward-facing seats on the left side of the cabin (ref. to option # 20 cabin configuration) are substituted by a second BLS system.

Each BLS system, fastened to the cabin seat tracks by means of suitable mounting plates, comprises:

1. one 6 feet Patient Loading Utility System (PLUS), consisting of a base that houses connections to medical equipment, storage compartments and provisions for sliding, supporting and securing the patient and for the installation of two 10 lt. oxygen bottles;

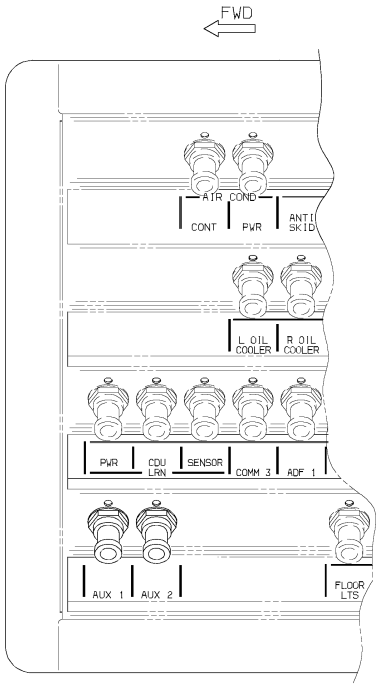

Figure 9-59. RIGHT CIRCUIT BREAKER PANEL - AUX 1 & AUX 2 CIRCUIT BREAKERS LOCATION

2. one AeroSled TS stretcher that latches to the top of the PLUS and provides patient restraint and support and allows the installation of an AeroSled TS Arch that includes mounting provision for medical apparatus, or, alternately,

   one AeroSled TD stretcher that provides hard points on its top deck for the restraint of cargo and medical equipment.

One AeroSled TS Side Arch, which provides connection to medical equipment, can also be installed and directly fastened to the cabin seat tracks.

A 2 feet PLUS cabinet is installed just in front of the cabin door and it is provided with a medical equipment storage compartment and with a seat cushion and a backrest for the accomodation of one attendant/medical passenger during flight.
The load ramp can be attached to suitable connections provided on the 2' PLUS cabinet making easier patient loading/unloading and, when not in use, can be folded and stowed in the baggage compartment.

The two rear cabinets are located close to the aft cabin wall, the higer one on the left and the lower one on the right side. Both cabinets are provided with drawers for medical equipment storage.

Each 6 feet PLUS unit includes:

1. the provision for the installation of an optional oxygen system (this system includes two customer supplied oxygen bottles with 200 BAR (2900 PSI) maximum pressure, high pressure regulator, distribution manifold, fill port and outlets) a pressure gauge, a pressure regulator for a pressure delivery of approximately 60 psi and an outlet port;
2. a vacuum pump with outlet port;
3. a compressed air system with a pump, a pressure regulator for a pressure delivery of 60 psi (outlet pressure can be adjusted by the operator through a control knob on the pressure regulator), a 26 cu.in. accumulator, an air/water separator, a 5 micron filter and an outlet port;
4. a 28VDC-230VAC/50 Hz, 330 VA inverter with two delivery connectors;
5. a 28VDC/12VDC 210 Watt converter with four delivery connectors;
6. a control panel lighting system;
7. control switches and circuit breakers for each electrical system.

The outlet ports for oxygen, vacuum and compressed air have different size fittings in order to avoid possible incorrect connections.

WARNING

Positively NO SMOKING while oxygen is in use by anyone in the airplane. Oil, grease or other lubricants in contact with high pressure oxygen can create an extreme fire hazard. Any such contact must be avoided.

WARNING

When a defibrillator is installed, only the self-adhesive type electrodes are allowed for use on board of the airplane. The use of any standard handle type electrodes must be absolutely avoided when on board of the airplane.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic Handling, Service and Maintenance information provided by the Section 8 of the Pilot's Operating Handbook are necessary for this Supplement.

PILOT'S OPERATING HANDBOOK AND ENAC APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 34 FOR TERRAIN AWARENESS AND WARNING SYSTEM (TAWS)

(Mod. 80-0459)

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the Terrain Awareness and Warning System (TAWS) Optional kit 80KA00076 is installed (with Mod. No. 80-0459) on the airplane.

The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement consult the basic Pilot's Operating Handbook and Approved Airplane Flight Manual.

The BFGoodrich TAWS8000 is a class B Terrain Awareness and Warning System (TAWS) designed to provide terrain situational awareness relative to current and predicted aircraft position compared with terrain information stored into a Database integrated with the system.

Based upon information from FMS, Air Data Computer, landing gear position and Heading source, the TAWS is able to determine the airplane state and intent and to provide warnings and alerts in advance of potential hazards. The system provides the following functions: Reduced Required Terrain Clearance (RTC), Imminent Terrain Impact (ITI), Premature descent, Excessive descent rate, Negative Climb Rate or Altitude Loss After Takeoff and Altitude of 500 ft. The alert information is provided to the flight crew both visually and aurally.

ABBREVIATIONS

ITI	Imminent Terrain Impact
RTC	Reduced Required Terrain Clearance
TAWS	Terrain Awareness and Warning System

SECTION 2 – LIMITATIONS

a. Navigation must not be predicated upon the use of the Terrain Awareness Display. The Terrain Awareness Display is intended to serve as a situational awareness tool only, and may not provide the accuracy and/or fidelity on which to solely base terrain or obstacle avoidance maneuvering decisions.

b. The Goodrich Avionics Systems, Inc. LANDMARK™ TAWS8000 Terrain Awareness and Warning System Pilot's Guide, part number 009-18000-001, latest revision, must be immediately available to the pilot when operating the aircraft with the LANDMARK™ TAWS8000 system. The software status stated in the Pilot's Guide should match that displayed on the equipment ID tag.

c. The use of the terrain awereness warning and terrain display functions is prohibited during QFE (atmospheric pressure at airport elevation) operations.

d. When the following conditions occur the GPS data are no more available but the TAWS system is not automatically disabled:

- GPS Sensor manually disabled through the FMS Control Display Unit;
- GPS Sensor automatically disabled when the Airplane is in FMS Approach Mode during "terminal approach" phase in an Airspace where FMS Approaches are not allowed.

CAUTION

When the GPS data are not available (GPS Sensor manually or automatically disabled) the TAWS must be inhibited through the TERR INHB pushbutton on the TAWS Control Panel.

e. The area of intended operation is identified by the proper Terrain Database P/N recorded in the Section 6 (Equipment List) of this Supplement.

f. During operations at certain locations, where it is known that caution/warning thresholds may be exceeded due to specific terrain or operating procedures, the TAWS system must be manually inhibited.

NOTE

To avoid giving unwanted alerts the TAWS system must be inhibited, through the TERR INHB pushbutton, when performing Steep Approaches.

SECTION 3 – EMERGENCY PROCEDURES

No changes to the basic emergency procedures provided by Section 3 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 4 – NORMAL PROCEDURES

SYSTEM INITIALIZATION

1. After Engine starting set the Avionics Switch to ON.
2. Verify the TAWS Circuit Breaker is engaged and the terrain display enabled.
3. The TAWS System begins its power-up Self-Test. The TAWS Control Panel switches and indicator lights should light up and then extinguish after a few seconds.
   If the system passes the test and all the lights are off the TAWS is operational.

SYSTEM SELF-TEST

1. Prior to initiate the TAWS Self-Test, make sure that all required aircraft systems are ON and functioning:
   a. Set altimeter adjusting knob to local altimeter setting.
   b. Ensure GPS present position is available.
   c. Make sure that heading flags are cleared.
   d. Select the terrain display on the MFD.
2. Press the SELF-TEST pushbutton:
   a. The TAWS TEST Annunciator will light and remain on for the duration of the test.
   b. Verify that all TAWS Annunciator lamps light.
   c. Verify audio announcement of the software version and terrain database.
   d. During the self-test, the terrain data will be removed from the terrain display and replaced by a test pattern.
3. At the end of the self-test the audio announcement "LANDMARK System Test Passed/ Failed" is heard on the Audio line.
4. If the System passes the self-test and the TERR NOT AVAIL and SNSR FAIL annunciation are extinguished, the system is operational.

NOTE

Perform the system self-test before the first flight of the day and whenever the system shows a failure condition.
The system self-test function is available only when the aircraft is on the ground.

ADVISORY CALLOUTS

The following advisory callout is provided:

"FIVE HUNDRED" occurs at 500 feet AGL

CAUTION AND WARNING ALERTS

According to the different Alert Conditions, the TAWS system generates the following Caution and Warning Alerts:

Alert Condition	Caution Alert		Warning Alert	
	(Aural)	(Visual)	(Aural)	(Visual)
Reduced Required Terrain Clearance (RTC)	"Caution, terrain; caution, terrain	"TERR (Amber)	"Terrain, terrain; pull up, pull up	"PULL UP (Red)
Imminent Terrain Impact (ITI)	"Caution, terrain; caution, terrain	"TERR (Amber)	"Terrain, terrain; pull up, pull up	"PULL UP (Red)
Premature Descent	"Too low, terrain	"TERR (Amber)	[None]	[None]
Excessive Descent Rate	"Sink Rate	"TERR (Amber)	"Pull up	"PULL UP (Red)
Negative Climb Rate or Altitude Loss after Tafeoff	"Don't Sink	"TERR (Amber)	[None]	[None]

RESPONSE TO A TAWS CAUTION

When a Terrain Awareness Caution occurs take positive action until the alert ceases.
Stop descending or initiate either a climb or a turn, or both, as necessary, based on analysis of all available instruments and information.

RESPONSE TO A TAWS WARNING

If a terrain awareness Warning occurs, immediately initiate and continue a climb that will provide maximum terrain clearance, or any similar approved vertical terrain escape maneuver, until all alerts cease.

Only vertical maneuvers are recommended, unless either operating in visual meteorological conditions (VMC), or the pilot determines, based on all available information, that turning in addition to the vertical escape maneuver is the safest course of action, or both.

COMBINED TCAS I & TAWS OPERATIONS

When both TAWS and TCAS I Systems are installed on the airplane, if a TAWS alert or altitude callout condition and a Traffic Advisory condition exist at the same time, the Traffic Advisory aural message is delayed with respect to the TAWS alert or callout aural annunciation.

SECTION 5 – PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 6 – WEIGHT AND BALANCE

EQUIPMENT LIST

Weight and balance data included in the Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the airplane is equipped with the TAWS Optional System.

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
34	**NAVIGATION**					
34-40	INDEPENDENT POSITION DETERMINING					
	TERRAIN AWARENESS AND AVOIDANCE SYSTEM (TAWS)					
	- TAWS8000 Remote Computer BFGoodrich 805-18000-001 with:	4.10	217.90	8.93		
	- System Configuration Module BF Goodrich 814-18005-001 and					
	- Remote Computer Mounting Tray BF Goodrich 805-18070-001 and					
	- 67DC Terrain Database Cartridge (1) BF Goodrich 805-18200-( )					
	- TAWS Control and Display Unit Mid Continent Instr. MD41-1108(5V)	0.50	22.40	0.11		
	(1) The suffix ( ) is related to the world regional coverage (e.g. -001 for North America coverage, -002 for worldwide coverage).					

SECTION 7 – DESCRIPTION AND OPERATION

The TAWS System consists of the following main components:

– Remote Computer - TAWS8000, equipped with the System Configuration Module and the 67DC Terrain Database Cartridge;

– TAWS Control and Display Unit.

The System provides visual alert information on both the EFIS-85 Multifunction Display (two-dimensional images depicted in three different colors, with respect to potential hazard level) and TAWS Control and Display Unit (alert and failure indicators) and generates aural warning on the Cockpit Audio System.

The System electrical power is provided by the Right Avionics Bus through the TAWS Circuit Breaker installed on the Copilot CB Panel. The Control Unit and its indicators are separately powered through the MFD Circuit Breaker, installed on the Pilot CB Panel.

NOTE

In the event of MFD display malfunction, check the MFD Circuit Breaker is still engaged for proper TAWS Control Unit operation.

REMOTE COMPUTER (TAWS 8000)

The TAWS 8000 Remote Computer is installed inside the cabinet vanity closet, in the rear side of the passengers cabin compartment, and is the primary unit of the TAWS system.

The TAWS 8000 interfaces with the following equipment:

– Air Data Computer, ADC-85( ), for barometric altitude data information;

– Flight Management System UNS-1( ), for aircraft present position and GPS status;

– Directional Gyro, DGS-65, for heading data information;

– Weather Radar Control Panel WXP-840( ), providing video data to be displayed on the Multifunction Display and receiving range data;

– Cockpit Audio System, for the generation of Aural Warnings;

– Main Landing Gear (Extended and Weight-On-Wheel conditions), to confirm phase of flight and disable warnings during on ground, landing and take-off operations.

The TAWS 8000 is provided with a System Configuration Module which is used to store the aircraft installation dependent information and a 67DC Terrain Database Cartridge, in which terrain information are stored.

TAWS CONTROL AND DISPLAY UNIT

The System is controlled by the TAWS Control and Display Unit, installed on the Pilot Instrument Panel Glareshield.

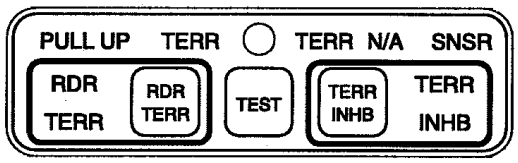

Figure 9-60. TAWS CONTROL PANEL

TERRAIN ANNUNCIATIONS

The Panel consists of switches, red-warning, amber-caution and indicator lights. The following list illustrates the function associated with each light and pushbutton:

PULL UP	(Red)	TAWS warning annunciation. The light remains illuminated until the alert condition is eliminated.
TERR	(Amber)	TAWS caution annunciation. The light remains illuminated until the alert condition is eliminated.
TERR N/A	(Amber)	The TAWS cannot calculate terrain alerts. No TAWS cautions or warnings are available. Terrain information may still be displayed depending on the cause of the annunciation.
SNSR	(Amber)	Invalid input. The TAWS may still be capable of issuing cautions and warnings, depending on failed input.
TERR INHB	(White)	The terrain alerting is inhibited. The indicator light is illuminated when the relevant pushbutton is depressed. Terrain information will still be available on the terrain display but all aural and annunciation alerts are inhibited.
RDR TERR	(White)	Terrain data are displayed on the MFD when the indicator light is illuminated.
TEST	(White)	Pressing the momentary pushbutton, when the airplane is on-ground, starts the pilot-initiated self-test. All the Panel lights illuminate while the test function is active. Self-test in flight is inhibited.

Refer to the TAWS8000 Pilot's Guide for additional annunciator information.

TERRAIN DISPLAY

The terrain data information can be displayed on the EFIS Multifunction Display, MFD-85( ), when the RDR Mode is selected on the MFD and the Radar is in STBY or ON condition. Alternately depressing the RDR TERR pushbutton, on the TAWS Control Panel, allows cycling modes from Radar to Terrain and then back to Radar.

When the TAWS Terrain Display is selected the magenta label "TERR" appears on the MFD screen.

NOTE

When the MFD is in TERR mode, the WX flag indicating the radar mode is still present on the screen.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic handling, service and maintenance instructions provided by Section 8 of the Pilot's Operating Handbook are necessary for this Supplement.

PILOT'S OPERATING HANDBOOK AND ENAC APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 35 FOR THE SEAFLIR II SYSTEM

(Mod. 80-0490, 80-0560)

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual when the SeaFLIR II Imaging System is installed on the airplane.

The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Airplane Flight Manual.

The SeaFLIR II Imaging System is certified for installation with the Option #10 Cabin Configuration (light seats).

SECTION 2 – LIMITATIONS

SEAFLIR II SYSTEM LIMITATIONS

During Take-off and Landing the 5.6 in. Cockpit Display must be positioned close to the cockpit right sidewall and properly secured with the related locking strip.

During operation of the 5.6 in. Cockpit Display:

– the display, in operating position, must be properly secured with the locking strip in order not to interfere with the copilot flight controls and not to disturb pilot visibility of the right side instruments;

– the operator sitting in front of the display, on the right side of the flight compartment, is not allowed to perform copilot operations;

– dual pilot certified operations are not allowed.

PLACARDS

1. On the right side of the cabin flight compartment, close to the 5.6" Display:

**STOW AND SECURE DURING
TAKE OFF AND LANDING**

SECURE DURING OPERATION

2. In the cabin passenger compartment, on the FLIR/TV Monitor Console leaf:

**LEAF MUST BE STOWED
FOR TAKE OFF AND LANDING**

SECTION 3 – EMERGENCY PROCEDURES

No changes to the basic emergency procedures provided by Section 3 of the Pilot's Operating Handbook and Airplane Flight Manual are necessary for this Supplement.

SECTION 4 – NORMAL PROCEDURES

OPERATIONS WITH SEAFLIR II SYSTEM INSTALLED

For the correct FLIR/TV Camera operation and to assure the Stabilized Gimbal Assembly service and operational life, it is recommended not to exceed the following Airspeed, Altitude and Air Temperature values:

1.	Maximum speed	218 KCAS	219 KIAS
2.	Maximum Altitude		
	a. FLIR non-operating		25,000 FT
	b. FLIR operating		15,000 FT
3.	Minimum Outside Air Temperature		
	a. FLIR non-operating	-46°C	(-51°F)
	b. FLIR operating	-20°C	(-4°F)
4.	Maximum Outside Air Temperature		
	a. FLIR non operating	+71°C	(+160°F)
	b. FLIR operating	+55°C	(+131°F)

PREFLIGHT CHECK - REAR FUSELAGE (LEFT SIDE)

During the preflight walk-around check the conditions of the Stabilized Gimbal Assembly (SGA) and related Installation Assembly on the Rear Fuselage (Left Side).

SECTION 5 – PERFORMANCE

Performance data provided by Section 5 of the basic Pilot's Operating Handbook and Airplane Flight Manual are to be corrected as follows when the SeaFlirII is installed on the airplane:

- Take-off Weight (Flaps MID) - ref. to Figure 9-61;
- Twin Engine Climb (Flaps MID) - ref. to Figure 9-62;
- Twin Engine Climb (Flaps Retracted) - ref. to Figure 9-63;
- One Engine Inoperative Climb (Flaps Retracted) - ref. to Figure 9-64;
- Balked Landing Climb (Flaps Down) - ref. to Figure 9-65;
- Maximum Cruise Power - 2000 RPM (ISA - 30° ÷ ISA + 30°) - ref. to Figures from 9-66 to 9-72;
- Maximum Range Power - 2000 RPM (ISA - 30° ÷ ISA + 30°) - ref. to Figures from 9-73 to 9-79.

For Single Engine Go Around Landing Weight, during CAT II approaches, performance data reported in Figure 9-45 of the Supplement No. 26 are to be corrected with those reported in Figure 9-80 of this Supplement.

SEAFLIR II SYSTEM INSTALLED

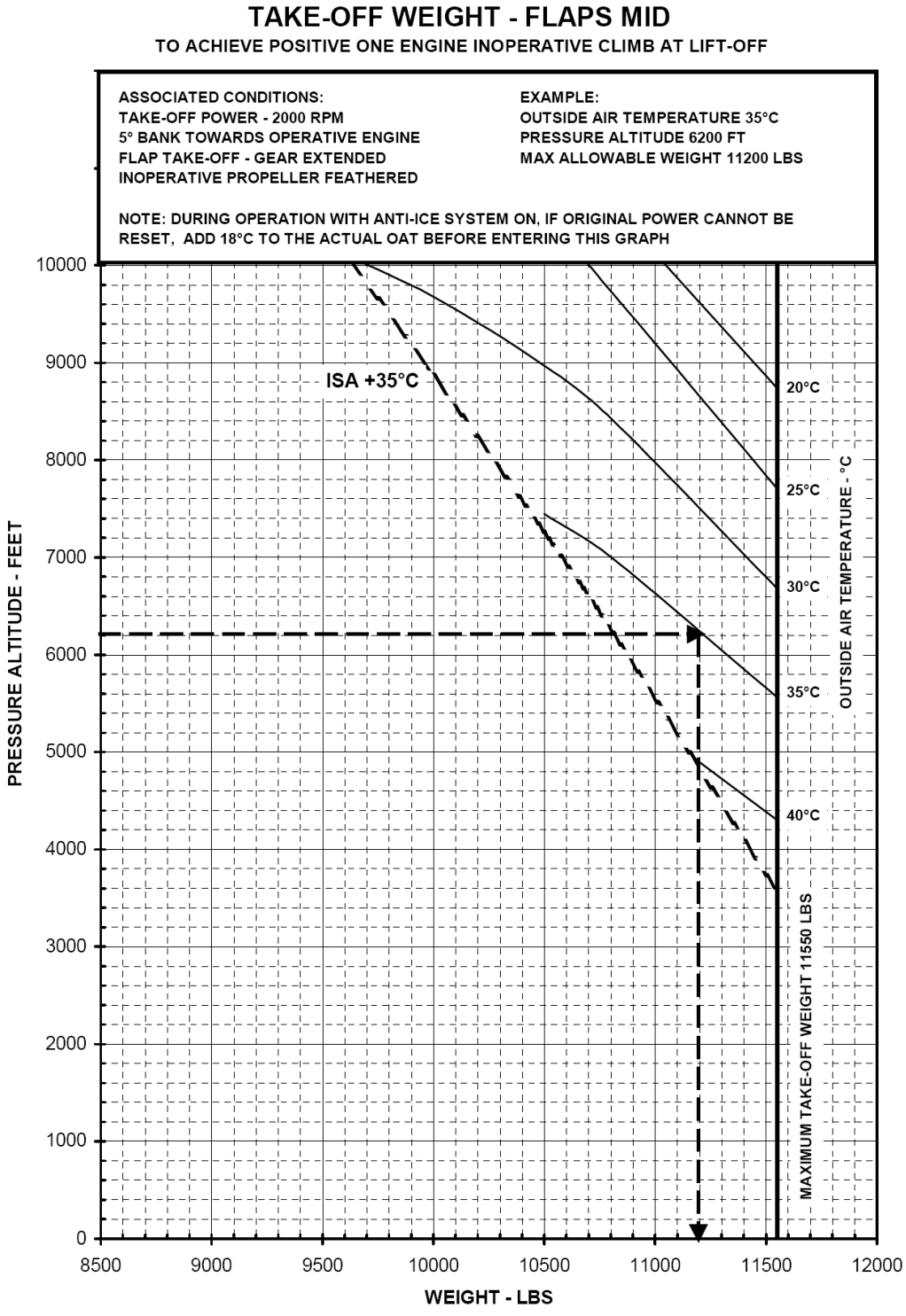

Figure 9-61. TAKE OFF WEIGHT - FLAPS MID

PIAGGIO AERO

SEAFLIR II SYSTEM INSTALLED

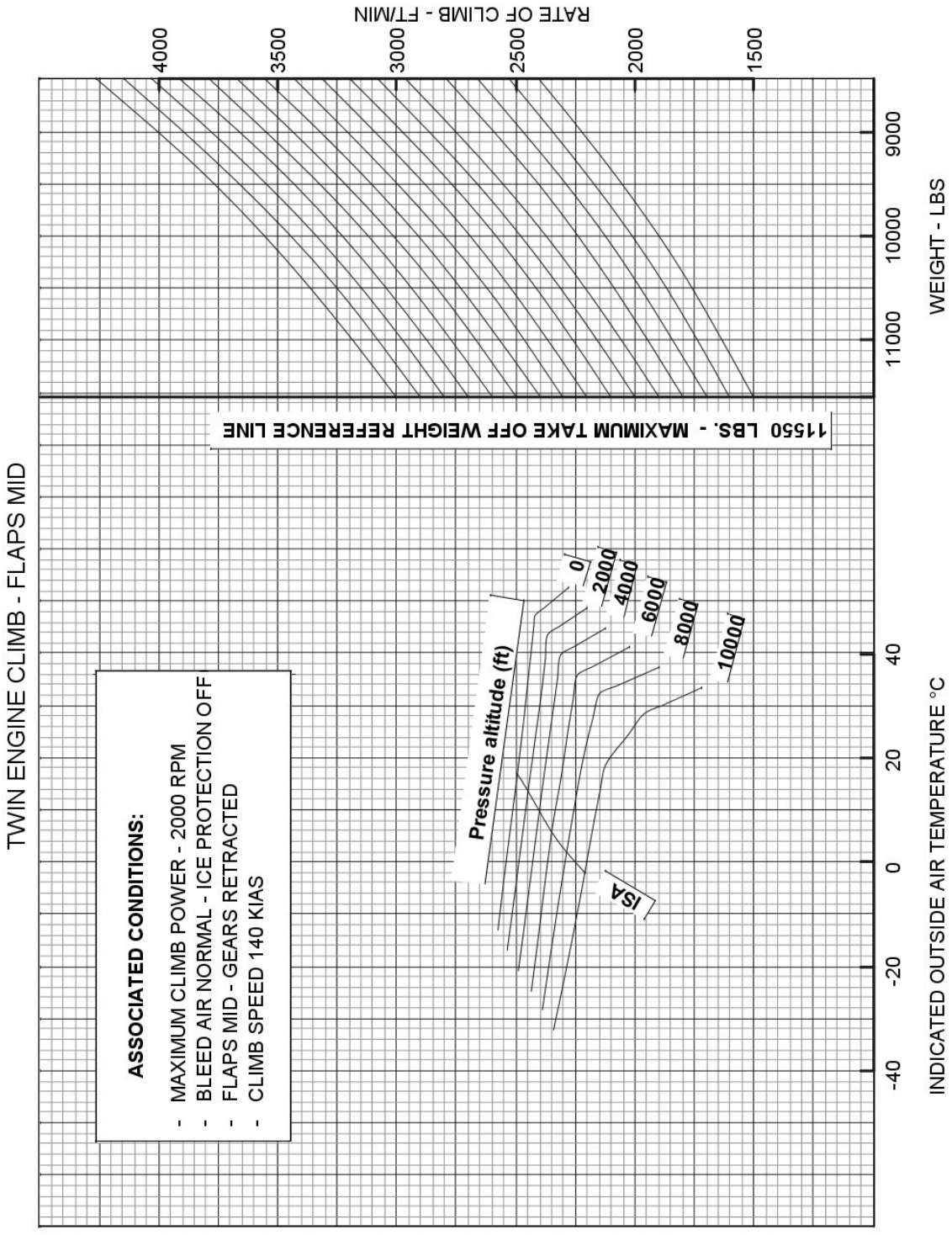

Figure 9-62. TWIN ENGINE CLIMB - FLAPS MID

SEAFLIR II SYSTEM INSTALLED

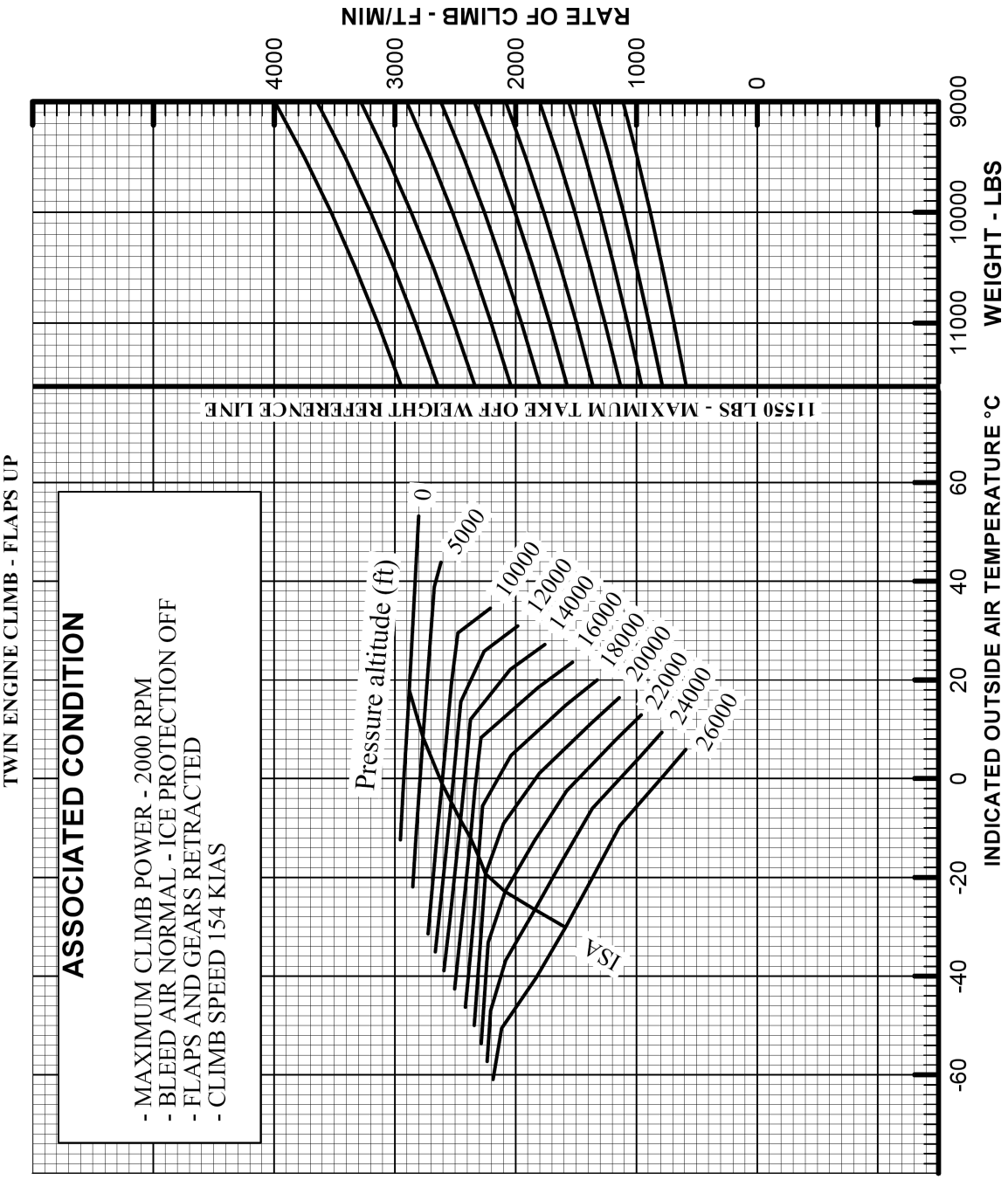

Figure 9-63. TWIN ENGINE CLIMB - FLAPS RETRACTED

PIAGGIO AERO

SEAFLIR II SYSTEM INSTALLED

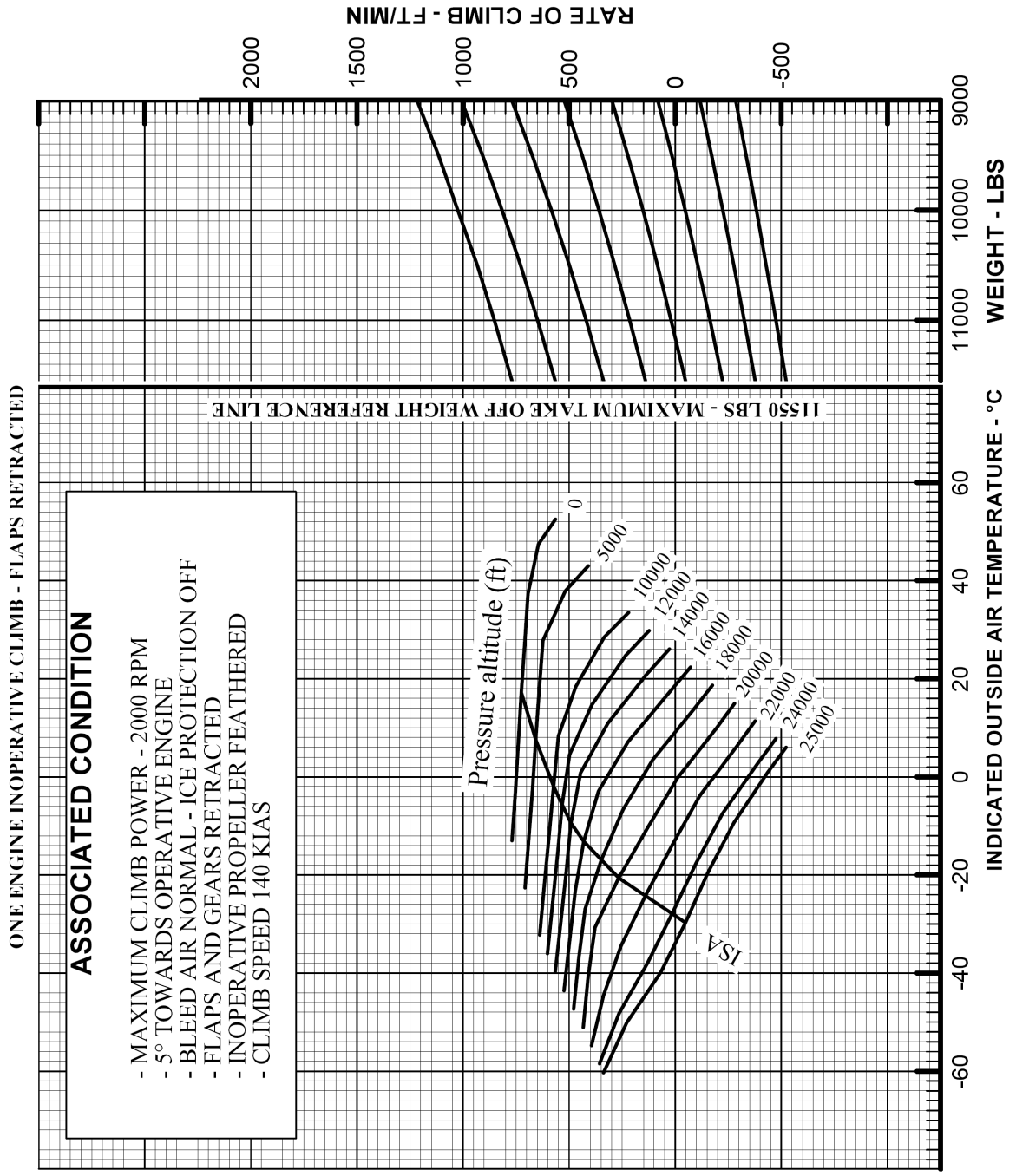

Figure 9-64. ONE ENGINE INOPERATIVE CLIMB - FLAPS RETRACTED

SEAFLIR II SYSTEM INSTALLED

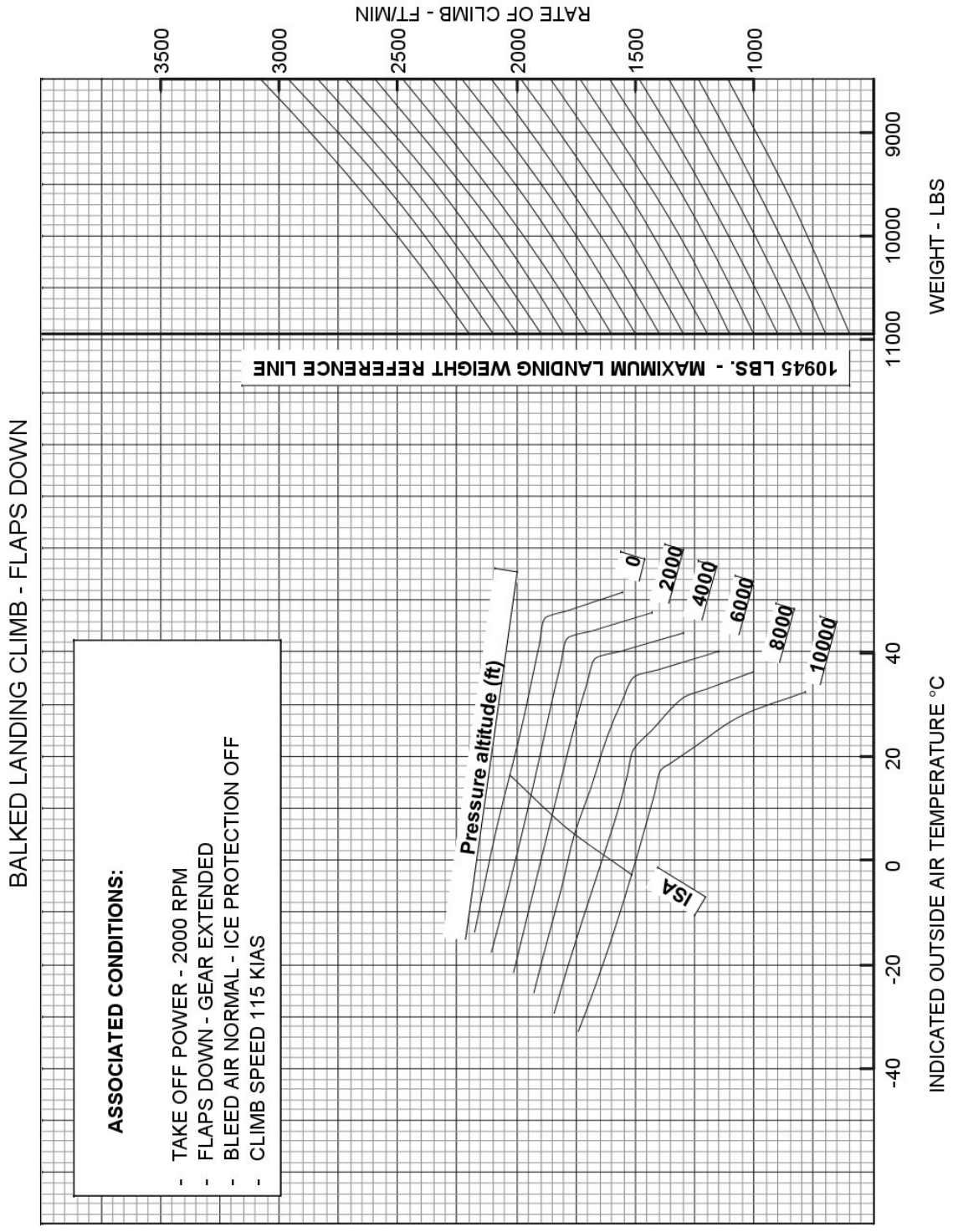

Figure 9-65. BALKED LANDING CLIMB - FLAPS DOWN

PIAGGIO AERO

SEAFLIR II SYSTEM INSTALLED

MAXIMUM CRUISE POWER
2000 RPM
ISA – 30°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS (4990 KG)		10000 LBS (4536 KG)		9000 LBS (4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	-10	14	1032	397	794	206	219	206	219	206	219
5000	-19	-3	1115	364	728	221	219	221	219	221	219
10000	-28	-19	1198	337	674	238	219	238	219	238	219
15000	-37	-35	1279	315	630	256	219	256	219	256	219
21000	-48	-54	1358	295	590	280	219	280	219	280	219
23000	-51	-60	1395	292	584	289	219	289	219	289	219
25000	-55	-66	1429	288	576	298	219	298	219	298	219

Figure 9-66. MAXIMUM CRUISE POWER - 2000 RPM - ISA – 30°C

MAXIMUM CRUISE POWER
2000 RPM
ISA – 20°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS (4990 KG)		10000 LBS (4536 KG)		9000 LBS (4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	0	32	1052	400	800	210	219	210	219	210	219
5000	-9	15	1138	368	736	226	219	226	219	226	219
10000	-18	-1	1223	342	684	243	219	243	219	243	219
15000	-27	-17	1306	321	642	261	219	261	219	261	219
21000	-37	-35	1389	302	604	287	219	287	219	287	219
23000	-41	-41	1427	299	598	296	219	296	219	296	219
25000	-44	-47	1463	296	592	305	219	305	219	305	219

Figure 9-67. MAXIMUM CRUISE POWER - 2000 RPM - ISA – 20°C

SEAFLIR II SYSTEM INSTALLED

MAXIMUM CRUISE POWER
2000 RPM
ISA – 10°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS		10000 LBS		9000 LBS	
						(4990 KG)		(4536 KG)		(4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	10	50	1072	400	800	214	219	214	219	214	219
5000	1	34	1159	373	746	230	219	230	219	230	219
10000	-8	18	1247	348	696	247	219	247	219	247	219
15000	-17	2	1333	327	654	267	219	267	219	267	219
21000	-27	-17	1419	309	618	293	219	293	219	293	219
23000	-30	-23	1459	307	614	302	219	302	219	302	219
25000	-34	-29	1496	304	608	312	219	312	219	312	219

Figure 9-68. MAXIMUM CRUISE POWER - 2000 RPM - ISA – 10°C

MAXIMUM CRUISE POWER
2000 RPM
ISA

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS		10000 LBS		9000 LBS	
						(4990 KG)		(4536 KG)		(4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	20	69	1091	403	806	218	219	218	219	218	219
5000	11	52	1181	377	754	234	219	234	219	234	219
10000	2	36	1271	354	708	252	219	252	219	252	219
15000	-6	20	1360	335	670	272	219	272	219	272	219
21000	-17	2	1449	317	634	299	219	299	219	299	219
23000	-20	-4	1490	315	630	309	219	309	219	309	219
25000	-23	-10	1528	312	624	319	219	319	219	319	219

Figure 9-69. MAXIMUM CRUISE POWER - 2000 RPM - ISA

PIAGGIO AERO

SEAFLIR II SYSTEM INSTALLED

MAXIMUM CRUISE POWER
2000 RPM
ISA + 10°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS (4990 KG)		10000 LBS (4536 KG)		9000 LBS (4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	31	87	1110	408	816	222	219	222	219	222	219
5000	21	71	1202	384	768	238	219	238	219	238	219
10000	13	55	1295	361	722	257	219	257	219	257	219
15000	4	39	1386	342	684	277	219	277	219	277	219
21000	-6	21	1478	325	650	305	219	305	219	305	219
23000	-9	15	1520	323	646	315	219	315	219	315	219
25000	-13	9	1560	320	640	325	219	325	219	325	219

Figure 9-70. MAXIMUM CRUISE POWER - 2000 RPM - ISA + 10°C

MAXIMUM CRUISE POWER
2000 RPM
ISA + 20°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS (4990 KG)		10000 LBS (4536 KG)		9000 LBS (4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	41	105	1128	416	832	225	219	225	219	225	219
5000	32	89	1223	391	782	243	219	243	219	243	219
10000	23	73	1318	370	740	261	219	261	219	261	219
15000	14	58	1412	351	702	282	219	282	219	282	219
21000	4	40	1506	334	668	311	219	311	219	311	219
23000	1	34	1550	332	664	321	219	321	219	321	219
25000	-2	28	1591	329	658	332	219	332	219	332	219

Figure 9-71. MAXIMUM CRUISE POWER - 2000 RPM - ISA + 20°C

SEAFLIR II SYSTEM INSTALLED

MAXIMUM CRUISE POWER
2000 RPM
ISA + 30°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11000 LBS		10000 LBS		9000 LBS	
						(4990 KG)		(4536 KG)		(4082 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	51	124	1146	425	850	229	219	229	219	229	219
5000	42	107	1243	401	802	247	219	247	219	247	219
10000	33	92	1340	379	758	266	219	266	219	266	219
15000	25	76	1437	361	722	287	219	287	219	287	219
21000	15	58	1534	342	684	317	219	317	219	317	219
23000	11	53	1579	338	676	327	219	327	219	327	219
25000	8	47	1622	334	668	338	219	338	219	338	219

Figure 9-72. MAXIMUM CRUISE POWER - 2000 RPM - ISA + 30°C

PIAGGIO AERO

SEAFLIR II SYSTEM INSTALLED

MAXIMUM RANGE POWER
2000 RPM
ISA – 30°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	-10	14	1032	397	206	219	998	392	206	219	963	388	206	219
5000	-19	-3	1115	364	221	219	1085	361	221	219	1054	357	221	219
10000	-29	-20	1198	337	238	219	1138	330	236	217	1077	322	233	214
15000	-39	-37	1142	298	244	208	1074	290	240	206	992	280	236	201
21000	-50	-58	1042	256	249	194	978	248	245	191	921	241	242	188
23000	-54	-65	1054	249	255	192	945	235	247	186	891	228	244	184
25000	-58	-72	1056	240	260	190	964	228	254	185	857	215	245	179

Figure 9-73. MAXIMUM RANGE POWER - 2000 RPM - ISA – 30°C

MAXIMUM RANGE POWER
2000 RPM
ISA – 20°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	0	32	1052	400	210	219	1017	395	210	219	982	390	210	219
5000	-9	15	1138	368	226	219	1106	364	226	219	1075	360	226	219
10000	-19	-2	1198	339	241	217	1116	329	237	214	1067	323	235	212
15000	-28	-19	1139	300	246	206	1068	291	243	203	998	283	239	200
21000	-40	-40	1056	260	254	193	987	251	249	190	928	244	246	187
23000	-44	-47	1078	254	260	192	957	239	251	185	898	231	248	183
25000	-48	-54	1069	245	264	189	974	232	258	184	867	219	250	178

Figure 9-74. MAXIMUM RANGE POWER - 2000 RPM - ISA – 20°C

SEAFLIR II SYSTEM INSTALLED

MAXIMUM RANGE POWER
2000 RPM
ISA – 10°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	10	50	1072	400	214	219	1036	395	214	219	1000	390	214	219
5000	1	34	1159	373	230	219	1127	368	230	219	1095	364	230	219
10000	-9	16	1164	337	240	213	1093	328	237	210	1030	320	234	207
15000	-18	-1	1125	301	248	203	1051	291	244	200	978	282	240	197
21000	-30	-21	1054	262	256	191	995	254	253	189	934	246	250	186
23000	-33	-28	1077	256	263	190	965	242	255	184	905	234	252	181
25000	-37	-35	1081	248	269	188	972	234	260	182	874	221	253	177

Figure 9-75. MAXIMUM RANGE POWER - 2000 RPM - ISA – 10°C

MAXIMUM RANGE POWER
2000 RPM
ISA

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	20	69	1091	403	218	219	1054	398	218	219	1017	392	218	219
5000	11	52	1158	374	232	217	1093	365	230	215	1025	355	227	212
10000	1	35	1157	339	242	210	1073	328	238	207	1019	320	236	205
15000	-8	17	1133	305	251	202	1044	293	246	197	969	283	242	194
21000	-20	-3	1063	266	260	190	990	256	255	186	930	248	252	184
23000	-23	-10	1088	261	267	189	973	246	259	183	898	236	253	179
25000	-27	-17	1095	253	273	187	980	238	264	180	880	225	257	175

Figure 9-76. MAXIMUM RANGE POWER - 2000 RPM - ISA

PIAGGIO AERO

SEAFLIR II SYSTEM INSTALLED

MAXIMUM RANGE POWER
2000 RPM
ISA + 10°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	30	86	1091	405	220	218	1022	394	218	215	951	383	215	212
5000	21	69	1108	370	231	212	1029	358	227	208	958	347	223	205
10000	11	52	1113	336	241	205	1025	323	236	201	953	313	232	198
15000	2	35	1114	306	252	198	1040	295	248	195	959	284	244	192
21000	-9	15	1071	270	264	189	1000	260	259	185	922	250	254	181
23000	-13	8	1097	265	271	188	967	248	261	181	906	239	257	178
25000	-17	1	1106	258	277	185	991	242	269	180	874	226	259	173

Figure 9-77. MAXIMUM RANGE POWER - 2000 RPM - ISA + 10°C

MAXIMUM RANGE POWER
2000 RPM
ISA + 20°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	40	104	1042	401	218	212	961	387	214	208	887	374	211	205
5000	31	87	1063	367	229	206	982	353	224	203	908	341	221	199
10000	21	70	1082	336	240	201	979	320	234	196	905	309	230	192
15000	12	53	1099	308	253	195	1009	295	247	191	924	283	242	187
21000	1	33	1058	272	265	186	993	263	261	183	917	252	256	179
23000	-3	26	1109	271	275	187	965	251	263	178	899	241	259	175
25000	-7	20	1127	265	283	185	999	247	272	178	881	231	263	172

Figure 9-78. MAXIMUM RANGE POWER - 2000 RPM - ISA + 20°C

SEAFLIR II SYSTEM INSTALLED

MAXIMUM RANGE POWER
2000 RPM
ISA + 30°C

PRESSURE ALTITUDE	IOAT		11000 LBS (4990 KG)				10000 LBS (4536 KG)				9000 LBS (4082 KG)			
			ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED		ENGINE TORQUE	ONE ENGINE FLOW	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	50	122	1023	404	218	209	937	388	214	205	852	372	210	201
5000	40	105	1032	367	228	202	949	352	223	198	860	337	218	194
10000	31	88	1052	336	239	197	947	319	233	191	871	307	228	188
15000	22	71	1105	313	256	194	1000	298	248	189	891	282	241	183
21000	11	51	1065	278	268	185	989	267	263	181	896	254	255	175
23000	7	45	1130	278	280	187	970	256	266	177	894	245	261	173
25000	3	38	1148	272	288	185	1017	254	277	178	874	234	264	170

Figure 9-79. MAXIMUM RANGE POWER - 2000 RPM - ISA + 30°C

SEAFLIR II SYSTEM INSTALLED

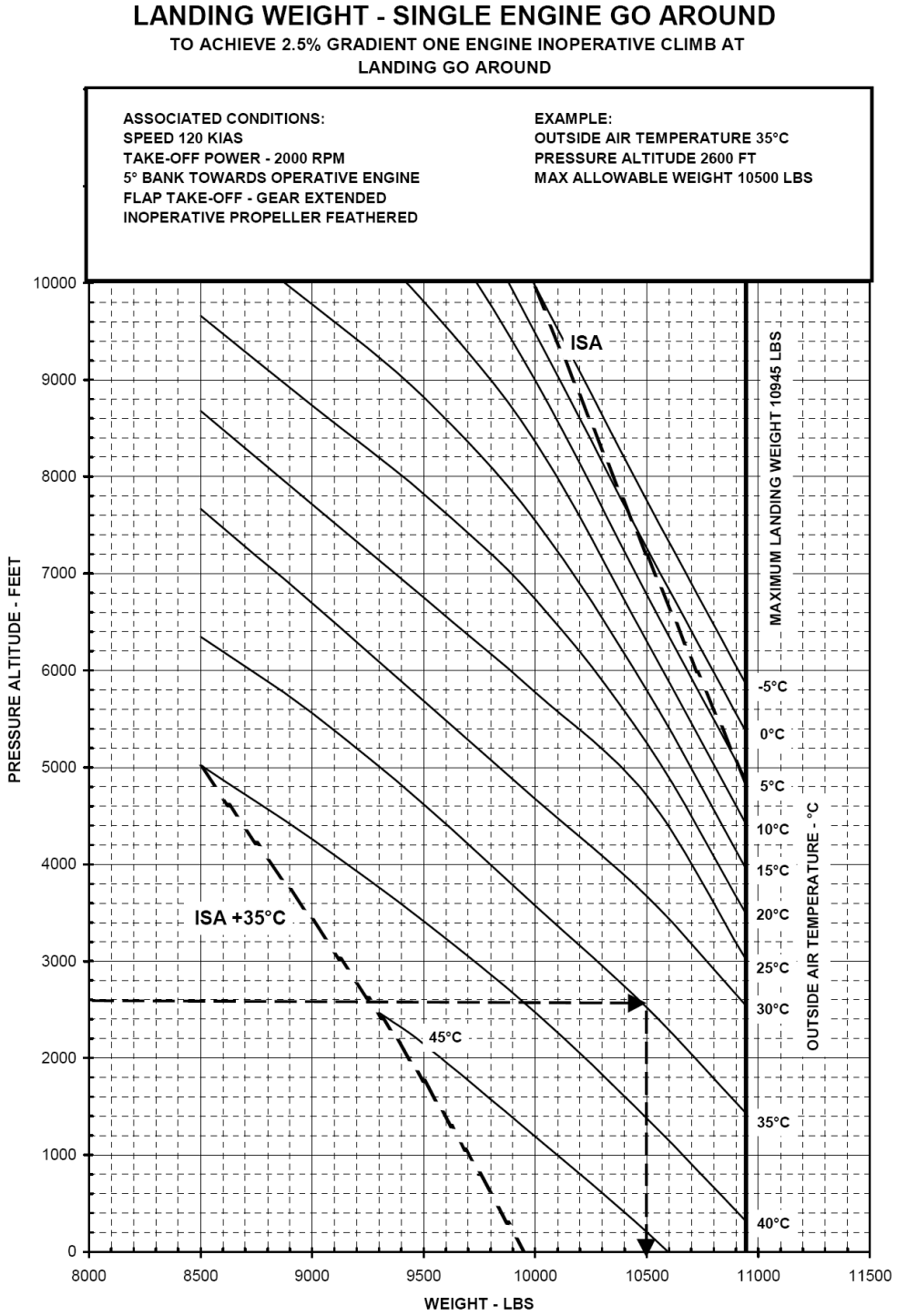

Figure 9-80. LANDING WEIGHT - SINGLE ENGINE GO AROUND

SECTION 6 – WEIGHT AND BALANCE

The following data must be transferred into the Equipment List at Section 6 of the basic Pilot's Operating Handbook and Airplane Flight Manual when the SeaFLIR II Imaging System is installed.

The SeaFLIR II Imaging System is certified for installation with the Option #10 Cabin Configuration, with light seats (ref. to Figure 6-25/1 on page 6-30/2).

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
93	**SURVEILLANCE**					
	SEAFLIR II *IMAGING SYSTEM*					
	- Stabilized Gimbal Assembly (SGA) FLIR Systems Inc. 18531-201	28.70	298.00	85.53	1	
	- FLIR/TV Camera Install. Assembly Piaggio 80K341324-801	7.90	310.70	24.55	1	
	- 5.6 in. Display Rosen 5601-064	2.20	28.00	0.62	1	
	- Display Base Receptacle Rosen 0100-064	2.20	28.00	0.62	1	
	- FLIR/TV Display Console Install. Piaggio 80-909894-801	61.70	90.20	55.65	1	
	which includes:					
	- Control Electronics Unit (CEU) FLIR Systems Inc. 18528-200				1	
	- Hand Control Unit (HCU) FLIR Systems Inc. 18217-200				1	
	- Signal Data Converter FLIR Systems Inc. 933609				1	
	- 14 in. Display Barco V9520020				1	
	- Hatch (FLIR/TV Camera not installed) Piaggio 80K341331-001	0.50	298.00	1.50	1	

SECTION 7 – DESCRIPTION AND OPERATION

The SeaFLIR II system mainly consists of the following equipment:

– Stabilized Gimbal Assembly (SGA) and related SGA installation assembly

– FLIR/TV Monitor Console, which includes the Control Electronics Unit (CEU), the Hand Control Unit (HCU), the Signal Data Converter and the 14" Operator Display

– 5.6" Cockpit Display

The Stabilized Gimbal Assembly (SGA), installed on the left side of the lower rear fuselage, is a gyro-stabilized unit containing an InfraRed (IR) camera system and a Charge Coupled Device (CCD) color camera.
The IR camera allows the operator to see in total darkness, through smoke, and other low visibility, low contrast situations. The CCD camera provides visible light imagery under normal and low light conditions. The stabilized Gimbal system provides stable video during airplane vibration and motion.

The FLIR/TV Camera (SGA) installation assembly constists of a removable spacer which connects the SGA to the airplane fuselage, and joined to the SGA through the interposition of a rubber gasket, a connector hatch and a fiberglass fairing.
All these parts can be removed and stored when the FLIR/TV Camera is not installed. An appropriate closing panel restores the rear fuselage surface.

The FLIR/TV Monitor Console is installed on the left side of the passenger cabin in front of the first seat; it is fixed to the airframe through the seat tracks and it is completely removable.
The Console houses the Control Electronics Unit (CEU), the Hand Control Unit (HCU), the Signal Data Converter and the 14 in. operator display.
The Console equipment are fed by the Left Generator Bus through the AUX1 Circuit Breaker on the Copilot CB Panel. An additional Circuit Breaker installed on the Console front side allows the operator to control the electrical power feeding to the Console equipment.

The CEU provides all the control and communication signals necessary to properly operate the SGA while providing video outputs for the operator display. The CEU interfaces, through the Signal Data Converter, with the Flight Management System which provides latitude, longitude, date and hour information.
The HCU is the operator interface for the SeaFLIR II Imaging System control, through the CEU Computer.

The CEU also interfaces with the 5.6" Display installed on the right (copilot) side of the crew cabin. The 5.6" Display allows the Copilot to see the same images and system information that are visualized on the 14" Operator Display.

The 5.6" Display is hinged to a swingable arm in order to be fully adjustable. A quick release pushbutton allows the display arm disconnection from its receptacle.

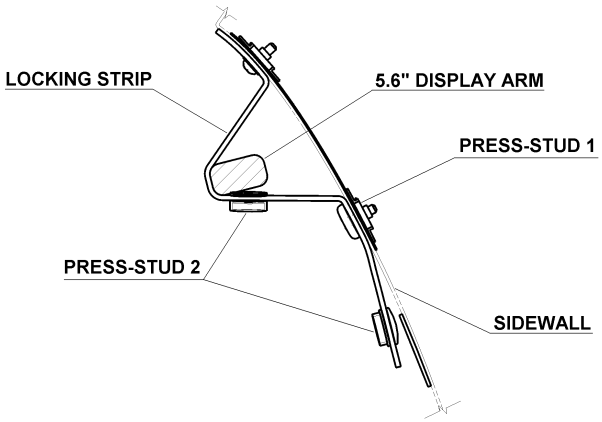

Figure 9-81. 5.6" DISPLAY ARM LOCKING STRIP (SIDE VIEW)

The 5.6" Display arm can be secured both in operating and non-operating (stowed) position by means of a locking strip fixed, at one side, to the right cockpit sidewall. Two press-studs allow the arm locking in the two different positions:

– when the display is non-operating (e.g. during Takeoff and Landing) it must be stowed close to the right sidewall and the arm secured as described in Figure 9-81 (press-stud 1 fastened);
– during operation of the display the press-stud 1 must be unfastened, the arm rotated so that the display is in front of the operator, the locking strip must be closed round the display arm and the press-stud 2 fastened.

NOTE

For more information about the system capabilities and operating instructions, refer to the SeaFLIR II Imaging System Operator's Manual, latest revision.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

No changes to the basic handling, service and maintenance instructions provided by Section 8 of the Pilot's Operating Handbook and Approved Airplane Flight Manual are necessary for this Supplement.

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PILOT'S OPERATING HANDBOOK AND ENAC APPROVED AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 36 FOR INCREASED MAXIMUM TAKE-OFF WEIGHT - MTOW 12100 LBS

(Mod. 80-0642)

SECTION 1 – GENERAL

This supplement must be attached to the Pilot's Operating Handbook and Approved Airplane Flight Manual to perform Increased Maximum Takeoff Weight (to 12100 lbs) operations when the Piaggio Service Bulletin SB-80-0215 (Mod. 80-0642) has been embodied on the airplane.

The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and Airplane Flight Manual, and the attached Supplements No. 1, No. 25, No. 26 and No. 31 (if applicable) only in those items listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and Airplane Flight Manual, and the applicable supplement.

ABBREVIATIONS

MLW	Maximum Landing Weight
MTOW	Maximum Takeoff Weight

SECTION 2 – LIMITATIONS

The following limitations apply to the P.180 airplane when performing increased MTOW, to 12100 lbs, operations.

2.1 AIRSPEED LIMITATIONS

SPEED		KCAS	KIAS
DESIGN MANEUVERING SPEED – V_A			
Do not make full or abrupt control movements above this speed.			
5,489 kg	12,100 lb.	201	202
5,239 kg	11,550 lb.	198	199
3,493 kg	7,700 lb.	176	177

NOTE

Linear interpolation may be used for intermediate gross weights.

MAXIMUM FLAP EXTENDED SPEED – V_{FE}		
Do not exceed this speed at the given flap setting.		
Flap MID	182	183
Flap DN	176	177
MAXIMUM LANDING GEAR OPERATING SPEED – V_{LO}		
Do not extend or retract landing gear above this speed.	180	181

2.2 AIRSPEED INDICATOR MARKINGS

MARKING	SIGNIFICANCE	KIAS
White Arc	Full flap operating range Lower limit is maximum weight stalling speed in landing configuration. Upper limit is maximum speed permissible for operating flaps in landing configuration.	99 to 150

2.7 WEIGHT LIMITS

a. Maximum Ramp Weight — 12,150 lbs (5511 kg)

b. Maximum Takeoff Weight — 12,100 lbs (5489 kg)
or as limited by "Maximum Takeoff Weight to achieve Takeoff Climb requirements" graph (ref. to Figure 9-86 on page 9-439)

c. Maximum Landing Weight — 11,500 lbs (5216 kg)

2.8 CENTER OF GRAVITY LIMITS

Weight		Forward Limit	Rearward Limit
Pounds	Kilograms	Inches Aft of Datum	Inches Aft of Datum
12,150	5,511	210.25	214.00
8,745	3,967	195.22	214.00
8,500	3,856	194.00	213.00
7,700	3,493	194.00	209.80
6,000	2,722	194.00	209.80

NOTE

Straight line variation between points indicated.
The Datum Line is located 236.22 inches (6,000 millimeters) forward of the rear pressure bulkhead centerline (at the intersection between the forward pressure bulkhead and cockpit floor centerlines).

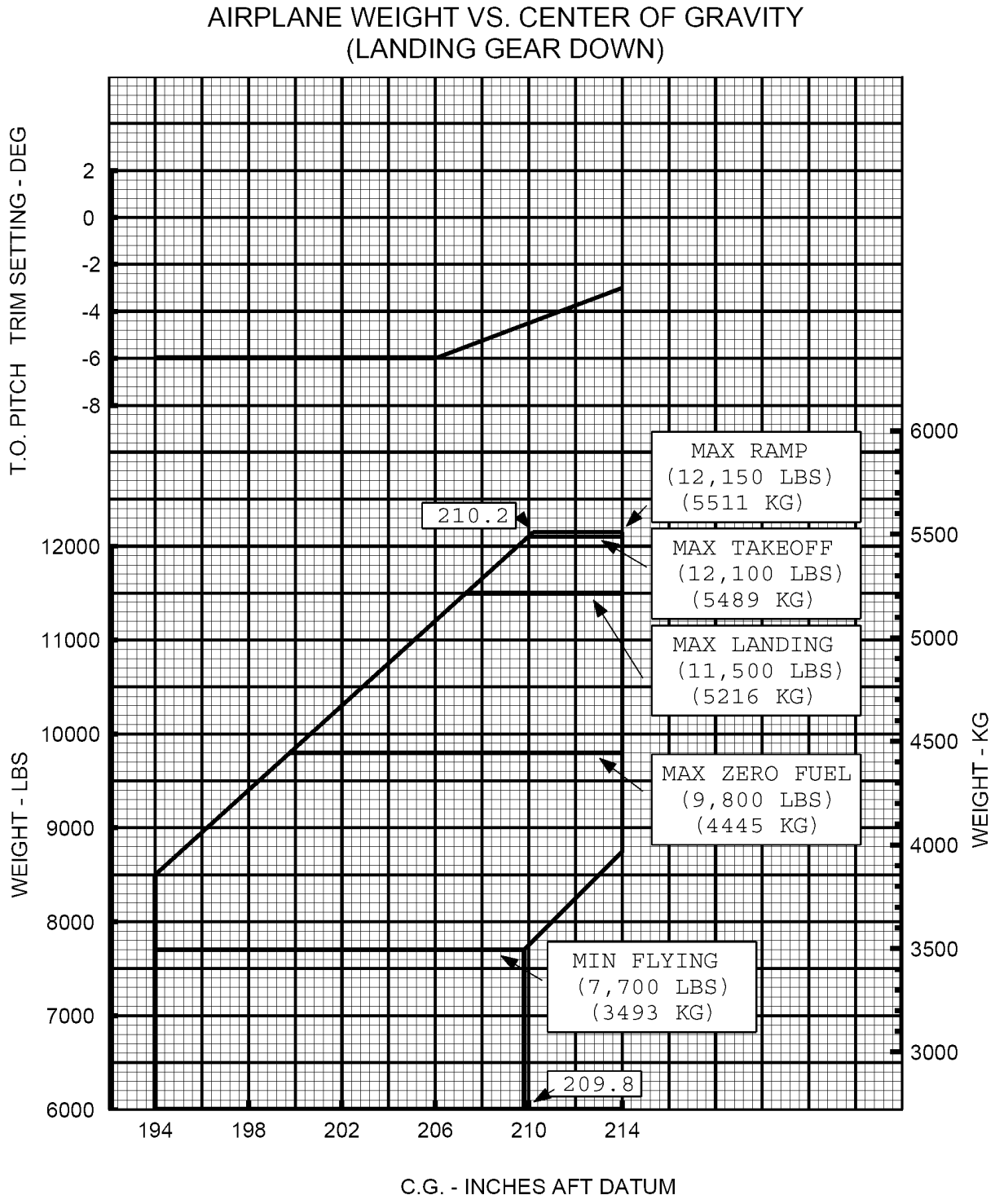

Figure 9-82. AIRPLANE WEIGHT VS. CENTER OF GRAVITY

2.11 FLIGHT LOAD FACTORS LIMITS (MANEUVERING)

a. Positive Load Factor (Flaps Up) 3.19 g

b. Negative Load Factor (Flaps Up) –1.28 g

2.19 UNPAVED RUNWAYS OPERATIONS AND STEEP APPROACH OPERATIONS

NOTE

Unpaved runways operations are prohibited.

NOTE

(APPLICABLE TO SUPPLEMENT N. 31
"STEEP APPROACH OPERATIONS")

Steep Approach Operations are prohibited for Maximum Landing Weight (MLW) greater than 10945 lbs (4965 kg).

2.21 OPERATION IN ICING CONDITIONS

No takeoff authorized with frost, snow or ice adhering to the propellers, windshields, powerplant installation and pitot/static ports, or with frost, snow or ice adhering to the wings, vertical and horizontal stabilizer or control surfaces.

Flight in meteorological conditions described as freezing rain or freezing drizzle is prohibited. Although not directly experienced on P.180, some of the following visual cues, in order to early detect any possibility of encountering severe icing condition, may be used (all or at least one of them):

1. Unusually extensive ice accreted on the airframe in areas not normally observed to collect ice.
2. Accumulation of ice on surface of wings.
3. Visible rain at temperatures below +5°C outside air temperature (OAT).
4. Droplets that splash or splatter on impact at temperatures below +5°C OAT.

NOTE

The prohibition on flight in freezing rain or freezing drizzle is not intended to prohibit purely inadvertent encounters with the specified meteorological conditions; however, pilots should make all reasonable efforts to avoid such encounters and must immediately exit the conditions if they are encountered.

Use of the autopilot is prohibited when any unusual ice (e.g. unusual runback ice) is observed forming aft of the protected surfaces of the wing, or when unusual lateral trim requirements or autopilot trim warnings are encountered.

NOTE

The autopilot may mask tactile cues that indicate adverse changes in handling characteristics; therefore, the pilot should consider not using the autopilot when any ice is visible on the airplane.

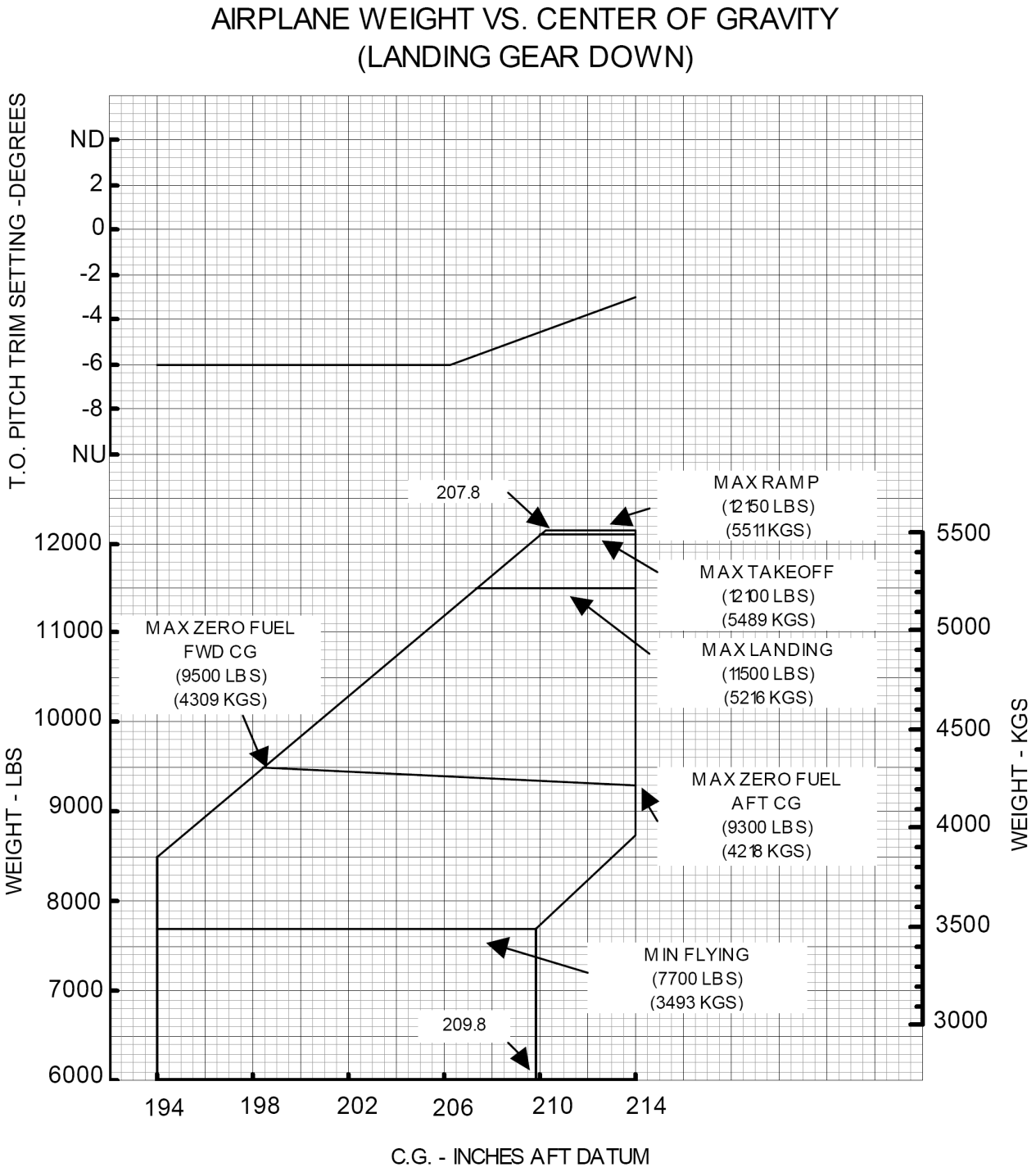

Figure 9-82 bis. AIRPLANE WEIGHT VS. CENTER OF GRAVITY

2.11 FLIGHT LOAD FACTORS LIMITS (MANEUVERING)

a. Positive Load Factor (Flaps Up) 3.19 g

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(APPLICABLE TO SUPPLEMENT N. 31
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NOTE

The prohibition on flight in freezing rain or freezing drizzle is not intended to prohibit purely inadvertent encounters with the specified meteorological conditions; however, pilots should make all reasonable efforts to avoid such encounters and must immediately exit the conditions if they are encountered.

Use of the autopilot is prohibited when any unusual ice (e.g. unusual runback ice) is observed forming aft of the protected surfaces of the wing, or when unusual lateral trim requirements or autopilot trim warnings are encountered.

NOTE

The autopilot may mask tactile cues that indicate adverse changes in handling characteristics; therefore, the pilot should consider not using the autopilot when any ice is visible on the airplane.

Wing ice inspection light must be operable prior to flight into known or forecast icing at night.

NOTE

This supersedes any relief provided by the Master Minimum Equipment List (MMEL), whenever applicable.

2.22 NOISE LEVEL

The corrected noise level according to EASA-CS36, based on ICAO Annex 16, vol. I, Ed. 1993, Amdt. 7, Chapter 10, and according to FAR 36, Appendix G, Amdt 36-24 for the Piaggio P.180 aircraft at the Max Certificated T.O. weight of 12100 lbs, is 87. 37 dB(A).

The allowed noise level according to both the mentioned regulations is 88. 00 dB(A).

No determination has been made by the Federal Aviation Administration that the noise level of the airplane is or should be acceptable or unacceptable for operation at, into or out of, any airport.

2.24 PLACARDS

Close to the left Mach/Airspeed Indicator, if Supplement N.26 for "CAT II operations" is not applicable; close to both Mach/Airspeed Indicators, if Supplement N.26 for "CAT II operations" is applicable:

MAXIMUM SPEED – KIAS

DESIGN MANEUVERING
V_A = 202 AT 12100 LBS
V_A = 177 AT 7700 LBS
FLAP OPERATING
V_{FO} = 170 UP/MID/UP
V_{FO} = 150 MID/DN/MID
FLAP EXTENDED DN V_{FE} = 177
LDG GEAR OPERAT V_{LO} = 181
STEERING V = 60

MINIMUM CONTROL V_{MC} = 100
(one engine inoperative)

On the instruments panel, if the Gravel Protection Kit P/N 80K174108-801 is installed:

OPERATION ON UNPAVED RUNWAYS IS PROHIBITED
FOR WEIGHTS GREATER THAN:
MTOW = 11550 LBS / 5239 KGS
MLW = 10945 LBS / 4965 KGS

On the left side of the instruments panel, if Supplement N.31 is applicable:

STEEP APPROACH OPERATIONS ARE PROHIBITED FOR MAXIMUM LANDING WEIGHT (MLW) GREATER THAN 10945 LBS (4965 KG)

SECTION 3 – EMERGENCY PROCEDURES

3.1 AIRSPEEDS FOR EMERGENCY OPERATIONS

One Engine Recommended Climb Speed (Flaps UP, L/G UP) . . . . . 140 KIAS

3.2 EMERGENCY PROCEDURES CHEKLIST

3.2.1 ENGINE FAILURES

ENGINE FAILURE DURING TAKEOFF AT OR AFTER ROTATION

If sufficient runway remains for a safe stop:

1. Directional control - MAINTAIN
2. Power levers - IDLE
3. Land straight ahead
4. Brakes - AS REQUIRED
5. Power levers - REVERSE as required

If insufficient runway remains or if the decision is made to continue the takeoff:

1. Directional control - MAINTAIN (Bank 5° max. towards operative engine when airborne)
2. Power levers - TAKEOFF
3. Landing gear (after climb established) - UP
4. Airspeed - ACCELERATE TO "ONE ENGINE 50 FEET HEIGHT SPEED" (Fig. 9-88)
5. Procedure Airspeed - INCREASE TO 130 KIAS MINIMUM
6. Flaps - UP (One engine inoperative recommended climb speed 140 KIAS)
7. Obstacles - CLEAR
8. Inoperative engine - PERFORM ENGINE SECURING Procedure

NOTE

Airplanes <u>without</u> S.L. 80-0020.

If the left engine is shut down (power lever to IDLE) the landing gear aural warning is activated all the time with the landing gear UP and the flap to MID.

* * * * * *

Airplanes incorporating S.L. 80-0020.

The landing gear aural warning is activated all the time with the landing gear UP and the flaps to MID.

* * * * * *

9. Taxi/Landing lights (if applicable) - OFF
10. Airspeed - INCREASE as required

11. Land at nearest suitable airport, performing the SINGLE ENGINE APPROACH AND LANDING Procedure

WARNING

The decision to continue a takeoff, single engine is primarily predicated upon, but not necessarily limited to, the aircraft's ability to climb on a single engine with the gear extended and flaps in the takeoff position. Prior to flight, review airfield requirements and determine that adequate single engine climb performance exists, considering aircraft weight, ambient conditions, and pilot proficiency, to safely complete the takeoff should an engine fail at or after rotation.

3.2.5 MAXIMUM GLIDE

1. Airspeed - per Maximum Glide Speed Chart (see below)
2. Gear - UP
3. Flaps - UP
4. Condition levers - CUT OFF

Maximum Glide Speed Chart

Weight - lbs	Speed - KIAS
12100	158
11550	155
11000	151
10000	144
9000	137
8000	129

Glide Ratio (Refer also to BEST GLIDE DISTANCE graph in Section 5 "Performance") . . . . . 2.3 NM/1000 ft

NOTE

When operating in sustained icing condition, the Glide Ratio may be reduced up to 50% approximately.

3.2.6 LANDING EMERGENCIES

LANDING WITHOUT ENGINE POWER

CAUTION

With both generators inoperative only essential, battery and hot battery busses are fed, for approximately 30 minutes depending on loads and battery charge.

1. Airplane configured - Per MAXIMUM GLIDE Procedure (if altitude permits)

When landing site assured:

2. Approach Speed - INCREASE the flaps DN approach speed (Fig. 9-137) by 20 KIAS
3. Condition levers - CUT OFF
4. Fuel firewall shut-off valves - CLOSED
5. Fuel pumps switches - OFF

If gear is to be extended:

NOTE

For particular terrain conditions it may be required to land with gear up.

6. Gear - DN (PER EMERGENCY GEAR EXTENSION Procedure)

NOTE

Gear extension requires approximately 60 handpump strokes: this procedure requires normally 90 sec.

7. Emergency gear selector - PUSH
8. Hydraulic pump switch - HYD
9. Landing distance - INCREASE the flaps DN landing distance (Fig. 9-137) by approximately 125%

NOTE

When operating in sustained icing condition, assume the same procedure except approach speed which, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 20 KIAS.
The landing distance, as compared with the flaps MID landing distance (Fig. 9-141), must be increased approximately by 90%.

SINGLE ENGINE APPROACH AND LANDING

WARNING

Do not exceed maximum fuel imbalance (200 lbs).

1. Inoperative engine - COMPLETE ENGINE SECURING Procedure
2. Condition lever (operating engine) - MAX RPM
3. Flaps - MID

NOTE

Airplanes <u>without</u> S.L. 80-0020.

If the left engine is shut down (power lever to IDLE) the landing gear aural warning is activated all the time with the landing gear UP and the flap to MID.

* * * * * *

Airplanes incorporating S.L. 80-0020.

The landing gear aural warning is activated all the time with the landing gear UP and the flaps to MID.

* * * * * *

4. Airspeed - 132 KIAS MIN.
5. Landing gear (when landing assured) - DN

When it is certain there is no possibility of go-around:

6. Flaps - DN
7. Approach speed - AS PER Fig. 9-137
8. Power lever - AS REQUIRED

After touchdown:

9. Brakes and reverse - AS REQUIRED
10. Landing distance - INCREASE the flaps DN landing distance (Fig. 9-137) approximately:
    30% if reverse thrust is not applied, or
    25% if reverse thrust is applied

NOTE

When operating in sustained icing condition assume the same procedure except: flap position must be MID, and approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 6 KIAS.
The flaps MID landing distance (Fig. 9-141) must be increased approximately by 30% if reverse thrust is not applied and by 25% if reverse thrust is applied.

SINGLE ENGINE GO-AROUND

1. Power - TAKE OFF
2. Airspeed - Minimum 125 KIAS
3. Flaps - MID
4. Landing gear - UP
5. Airspeed - INCREASE TO 130 KIAS MINIMUM
6. Flaps - UP

NOTE

Airplanes without S.L. 80-0020.

If the left engine is shut down (power lever to IDLE) the landing gear aural warning is activated all the time with the landing gear UP and the flap to MID.

* * * * * *

Airplanes incorporating S.L. 80-0020.

The landing gear aural warning is activated if the flaps are not retracted within approximately 25 seconds after the landing gear has been retracted.

* * * * * *

7. Taxi/Landing lights (if applicable) - OFF
8. Airspeed - INCREASE as required

WARNING

When operating in sustained icing conditions, insufficient performance may exist to successfully carry out a single engine go-around.

LANDING WITH PRIMARY LONGITUDINAL CONTROL FAILED

When ready for approach:

1. Trim - IN LEVEL FLIGHT TO 140 KIAS
2. Runway - Select longest in area suitable for a low angle descent
3. Landing gear - DN
4. Flaps - MID
5. Trim - TO 135 KIAS
6. Power - AS REQUIRED
7. Condition levers - MAX RPM
8. Flaps - DN
9. Trim - TO 125 KIAS

NOTE

When operating in sustained icing condition assume the same procedure except: flap position must be MID, and approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 6 KIAS.

When positioned over the runway, flare airplane with longitudinal trim and slowly reduce power:

10. Brakes (after nose wheel touchdown) - AS REQUIRED
11. Reverse - AS REQUIRED

LANDING WITH STABILIZER JAMMED

1. Condition levers - MAX RPM
2. Power levers - AS REQUIRED
3. Landing gear - DN

Stabilizer jammed in nose down trim position:

4. Flaps - MID
5. Approach Speed - INCREASE the flaps DN approach speed (Fig. 9-137) by 15 KIAS
6. Brakes and reverse - AS REQUIRED
7. Landing distance - INCREASE the flaps DN landing distance (Fig. 9-137) by approximately 50%

Stabilizer jammed in nose up trim position:

8. Flaps - DN
9. Approach speed - AS PER Fig. 9-137
10. Brakes and reverse - AS REQUIRED

NOTE

When operating in sustained icing conditions assume the same procedure except: flap position must be MID, whatever is the stabilizer position, and the approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 10 KIAS.
The flaps MID landing distance (Fig. 9-141) must be increased approximately by 25%.

LANDING WITH LONGITUDINAL SPRING FAILED

1. Condition levers - MAX RPM
2. Power levers - AS REQUIRED
3. Landing gear - DN
4. Flap - MID
5. Approach Speed - INCREASE the flaps DN approach speed (Fig. 9-137) by 15 KIAS
6. Brakes and reverse - AS REQUIRED
7. Landing distance - INCREASE the flaps DN landing distance (Fig. 9-137) by approximately 50% if the reverse thrust is not applied

NOTE

When operating in sustained icing condition, assume the same procedure except approach speed which, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 10 KIAS.
The flaps MID landing distance (Fig. 9-141) must be increased approximately by 20%.

LANDING WITH AUTOFEATHER SYSTEM INOPERATIVE (AMBER AUTOFEATHER LIGHT ON)

1. Condition lever - MAX RPM
2. Power levers - AS REQUIRED
3. Landing gear - DN
4. Flap - MID
5. Approach Speed - INCREASE the flaps DN approach speed (Fig. 9-137) by 15 KIAS
6. Brakes and reverse - AS REQUIRED
7. Landing distance - INCREASE the flaps DN landing distance (Fig. 9-137) by approximately:
   50% if reverse thrust is not applied, or
   26% if reverse thrust is applied

NOTE

When operating in sustained icing condition, assume the same procedure except approach speed which, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 6 KIAS.
The flaps MID landing distance (Fig. 9-141) must be increased approximately by 10% if reverse thrust is not applied or by 5% if reverse thrust is applied.

ASYMMETRIC FLAP LANDING (FLAP SYNC LIGHT ON)

1. FLAP SYSTEM MALFUNCTION Procedure - COMPLETE
2. Condition levers - MAX RPM
3. Power levers - AS REQUIRED
4. Landing gear - DN
5. Approach speed - INCREASE the flaps DN approach speed (Fig. 9-137) as indicated in the table below
6. Brakes and reverse - AS REQUIRED
7. Landing distance - if the reverse thrust is not applied INCREASE the flaps DN landing distance (Fig. 9-137) approximately as indicated in the table below:

Outboard Flap Position	Speed Increase	Landing Distance Increase
DN	5 KIAS	10%
MID	15 KIAS	50%
UP	20 KIAS	65%

NOTE

When operating in sustained icing conditions assume the same procedure except approach speed which, as compared with the flaps MID approach speed (Fig. 9-141), must be increased as indicated in the table below:

Outboard Flap Position	Speed Increase	Landing Distance Increase (Fig. 9-141)
MID	10 KIAS	20%
UP	20 KIAS	40%

LANDING WITH FLAPS RETRACTED

1. Approach Speed - INCREASE the flaps DN approach speed (Fig. 9-137) by 20 KIAS
2. Condition levers - MAX RPM
3. Power levers - AS REQUIRED
4. Landing gear - DN

After touchdown

5. Reverse - AS REQUIRED
6. Landing distance - INCREASE the flaps DN landing distance (Fig. 9-137) by approximately:
   65% if reverse thrust is not applied, or
   55% if reverse thrust is applied

NOTE

When operating in sustained icing conditions assume the same procedure except approach speed which, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 20 KIAS.
The landing distance, as compared with the flaps MID landing distance (Fig. 9-141), must be increased approximately by 40% if reverse thrust is not applied or by 30% if reverse thrust is applied.

3.3 AMPLIFIED EMERGENCY PROCEDURES

3.3.1 ENGINE FAILURES

ENGINE FAILURE DURING TAKEOFF AT OR AFTER ROTATION

If sufficient runway remains for a safe stop or the decision is made to abort the takeoff, maintain directional control. Pull the power lever of the engines to IDLE and land straight ahead. After touch down use brakes and reverse as required, engaging reverse below 1900 Prop RPM or 5% drop from the set value.

Should a suitable landing area exist, and the decision is made to land the airplane following an engine failure at, or after rotation initiation, the pilot should be aware that performance charts are not presented in this manual for this condition and that the total distance required to stop will exceed the published Accelerate/Stop performance shown in Section 5.

If insufficient runway remains or if the decision is made to continue the takeoff, maintain directional control (banking the plane 5° max toward the operative engine when airborne) and maintain the maximum takeoff power while maintaining torque and ITT within limits.
After assuring that the aircraft will not settle back to the runway, retract the landing gear and accelerate to the "one engine 50 feet height speed" as per Fig. 9-88 (Accelerate/Go Distance Over 50 Feet Obstacle graph) at Section 5 of this Supplement.
Accelerate to a speed of 130 KIAS minimum, then retract the flaps and the taxi/landing lights (if applicable) to achieve the one engine inoperative recommended climb speed of 140 KIAS.

Maintain this speed until clearing all obstacles within the immediate vicinity of the airport. After all these obstacles have been cleared, perform the ENGINE SECURING procedure.

NOTE

Airplanes <u>without</u> S.L. 80-0020.

If the left engine is shut down (power lever to IDLE) the landing gear aural warning is activated all the time with the landing gear UP and the flap to MID.

* * * * * *

Airplanes incorporating S.L. 80-0020.

The landing gear aural warning is activated if the flaps are not retracted within approximately 25 seconds after the landing gear has been retracted.

* * * * * *

Place the autofeather arm switch in the OFF position and increase airspeed as required.
Once the above procedures have been completed and the aircraft is at a safe altitude, an airstart may be attempted. (If the start is unsuccessful, complete the ENGINE SECURING Procedure on the inoperative engine).
Whether the start is successful or unsuccessful the aircraft should be landed at the nearest suitable airport performing the SINGLE ENGINE APPROACH AND LANDING Procedure.

WARNING

The decision to continue a takeoff, single engine is primarily predicated upon, but not necessarily limited to, the aircraft's ability to climb on a single engine with the gear extended and flaps in the takeoff position. Prior to flight, review airfield requirements and determine that adequate single climb performance exists, considering aircraft weight, ambient conditions and pilot proficiency, to safely complete the takeoff should an engine fail at or after rotation.

3.3.5 MAXIMUM GLIDE

With the flaps and the landing gear UP, the propellers feathered (condition lever in CUT OFF position) the chart below shows the airspeed to be used to attain the least loss in altitude.
Consult the BEST GLIDING DISTANCE diagram on Section 5 "Performance" of the basic POH/AFM to know the horizontal distance covered.

Maximum Glide Speed Chart

Weight - lbs	Speed - KIAS
12100	158
11550	155
11000	151
10000	144
9000	137
8000	129

Glide Ratio (Refer also to BEST GLIDE DISTANCE graph in Section 5 "Performance") . . . . . 2.3 NM/1000 ft

When operating in sustained icing conditions, the ice build-up on the unprotected parts and the runback ice on the forward and main wings will cause a strong drag increment. In these conditions (ice accretion of approximately 3 inches on the main wing tips) the Glide Ratio may decrease up to 50%.

3.3.6 LANDING EMERGENCIES

LANDING WITHOUT ENGINE POWER

CAUTION

With both generators inoperative only essential, battery and hot battery busses are fed, for approximately 30 minutes depending on loads and battery charge.

If an emergency indicates the need to make an approach and landing without the use of engine power, the airplane should first be configured per the MAXIMUM GLIDE Procedure if sufficient altitude permits.

When both engines have failed, hydraulic and flap systems are not operative in flight since their circuits are not fed by the battery.
In this condition landing gear has to be lowered as per EMERGENCY GEAR EXTENSION Procedure and flaps will be in UP position.

NOTE

Gear extension requires approximately 60 handpump strokes: this procedure requires normally 90 sec.

NOTE

For particular terrain conditions it may be required to land with gear up.

When the landing gear extension has been completed and only if the gear is confirmed to be down and locked, push in the emergency gear selector and switch to HYD position the hydraulic pump.
Once it is assured that the selected landing site will be reached, assume an approach speed increased by 20 KIAS as compared with the flaps DN approach speed (Fig. 9-137).

Place the condition levers in CUT OFF, CLOSE the firewall shut-off valves and switch OFF the fuel pumps.

After touchdown a particular attention has to be paid since brake operation will become harder and landing distances will increase approximately by 125% as compared with the flaps DN landing distance (Fig. 9-137).

The procedure just described applies also when operating in sustained icing conditions with the exception that the approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 20 KIAS.
The landing distance, as compared with the flaps MID landing distance (Fig. 9-141), must be increased approximately by 90%.

SINGLE ENGINE APPROACH AND LANDING

WARNING

Do not exceed maximum fuel imbalance (200 lb.).

Ensure that the ENGINE SECURING Procedure is complete. Turn OFF the crossfeed valve if open and advance the condition lever to MAX RPM, extend the flap to MID position and maintain a speed of 132 KIAS minimum.

NOTE

Airplanes <u>without</u> S.L. 80-0020.

If the left engine is shut down (power lever to IDLE) the landing gear aural warning is activated all the time with the landing gear UP and the flap to MID.

* * * * * *

Airplanes incorporating S.L. 80-0020.

The landing gear aural warning is activated all the time with the landing gear UP and the flaps to MID.

* * * * * *

If conditions permit, burn as much fuel as possible.
When landing site is assured lower the landing gear.

When it is certain there is no possibility of go-around, extend the flaps to DN and assume approach speed as per Fig. 9-137.
Adjust the power as required and after touching down, if necessary, apply reverse thrust slowly and cautiously. Reverse thrust must be applied when the prop RPM has dropped to 1900 RPM.
The landing distance, as compared with the flaps DN landing distance (Fig. 9-137), will increase by 30% if reverse thrust is not applied and by 25% if reverse thrust is applied.

The procedure just described applies also when operating in sustained icing conditions with the exception that the flap position must be MID and the approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 6 KIAS.
The flaps MID landing distance (Fig. 9-141) must be increased by 30% if reverse thrust is not applied or by 25% if reverse thrust is applied.

SINGLE ENGINE GO-AROUND

To execute a single engine go-around, apply takeoff power to the operating engine. Attain a minimum speed of 125 KIAS and retract flaps to MID position, if they are fully down.
Retract landing gear and increase airspeed to 130 KIAS minimum, then retract the flaps and the taxi/landing lights (if applicable). Increase the airspeed as required.

NOTE

Airplanes <u>without</u> S.L. 80-0020.

If the left engine is shut down (power lever to IDLE) the landing gear aural warning is activated all the time with the landing gear UP and the flap to MID.

* * * * * *

Airplanes incorporating S.L. 80-0020.

The landing gear aural warning is activated if the flaps are not retracted within approximately 25 seconds after the landing gear has been retracted.

* * * * * *

WARNING

When operating in sustained icing conditions, insufficient performance may exist to successfully carry out a single engine go-around.

LANDING WITH PRIMARY LONGITUDINAL CONTROL FAILED

In the event it becomes necessary to use trim for longitudinal control, trim the airplane to 140 KIAS in level flight. Select the longest runway in the area suitable for a low angle approach.
Extend landing gear, set flaps to MID position, maintain 135 KIAS and adjust power for a low angle approach, lower the flaps to DN and trim the plane to 125 KIAS. When positioned over the landing runway, flare the airplane using the reduction of power and the longitudinal trim. After landing and when the nose gear is on the runwary, apply reverse as required, when the propeller speed has dropped to 1900 RPM.

The procedure just described applies also when operating in sustained icing conditions with the exception that the flap position must be MID and the approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 6 KIAS.

LANDING WITH STABILIZER JAMMED

If elevator pull force is encountered, the stabilizer is jammed in a nose down trim position.
Move, if possible, the center of gravity aft and land as soon as practical to minimize the forward C.G. movement due to fuel-burned.
Extend landing gear and set flaps to MID.
Assume an approach speed increased by 15 KIAS as compared with the flaps DN approach speed (Fig. 9-137). The flaps DN landing distance (Fig. 9-137) shall be increased by approximately 50% if reverse is not applied.

If elevator push force is encountered, the stabilizer is jammed in nose up trim position. Move center of gravity forward if possible.
Extend landing gear and set flaps to DN. Assume the approach speed as per Fig. 9-137.

The procedure just described applies also when operating in sustained icing conditions with the exception that the flap position must be MID, whatever is the stabilizer position, and the approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 10 KIAS.
The flaps MID landing distance (Fig. 9-141) must be increased by 25% if reverse thrust is not applied.

LANDING WITH LONGITUDINAL CONTROL SPRING FAILED

Having assumed the up-down spring failure (refer to LONGITUDINAL CONTROL SPRING FAILURE Procedure), land with flaps in MID position.
Assume an approach speed increased by 15 KIAS as compared with the flaps DN approach speed (Fig. 9-137).
After touchdown, engage reverse as required.
The landing distance, as compared with the flaps DN landing distance (Fig. 9-137), must be increased by 50% if the reverse thrust is not applied.

The procedure just described applies also when operating in sustained icing conditions with the exception that the approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 10 KIAS.
The flaps MID landing distance (Fig. 9-141) must be increased approximately by 20%.

LANDING WITH AUTOFEATHER SYSTEM INOPERATIVE

The amber AUTOFEATHER light on the annunciator panel is normally illuminated when the system is not armed and the landing gear is down.
If, after having armed the system, the light remains illuminated, the autofeather system has to be assumed inoperative and the landing will be performed with flaps in MID position.
Assume an approach speed increased by 15 KIAS as compared with the flaps DN approach speed (Fig. 9-137).
After touchdown, engage brakes and reverse.
The landing distance, as compared with the flaps DN landing distance (Fig. 9-137), will increase approximately by 50% if reverse thrust is not applied and by 26% if reverse thrust is applied.

The procedure just described applies also when operating in sustained icing conditions with the exception that the approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 6 KIAS.
The flaps MID landing distance (Fig. 9-141) must be increased approximately by 10% if reverse thrust is not applied or by 5% if reverse thrust is applied.

ASYMMETRIC FLAP CONDITION LANDING

In case of a flap system failure complete the FLAP SYSTEM MALFUNCTIONS Procedure.
Prior to reaching an altitude of 50 ft. above runway, assure that the landing gear is extended and adjust power as required.
The flaps DN approach speeds and landing distances (Fig. 9-137) shall be increased, depending on the position of outboard wing flaps, as indicated in the following table:

Outboard Flap Position	Speed Increase	Landing Distance Increase (if reverse thrust is not applied)
DN	5 KIAS	10%
MID	15 KIAS	50%
UP	20 KIAS	65%

The procedure just described applies also when operating in sustained icing conditions with the exception that the flaps MID approach speeds and landing distances (Fig. 9-141), must be increased as indicated in the table below.

Outboard Flap Position	Speed Increase	Landing Distance Increase (Fig. 9-141)
MID	10 KIAS	20%
UP	20 KIAS	40%

LANDING WITH FLAPS RETRACTED

In case of an electrical failure in the feeding circuit of the flap systems or a failure in the outboard wing flap system, a landing with no flaps has to be considered.

If conditions permit, burn as much fuel as possible.

Set the condition levers to MAX RPM and use power levers as required.
Assume an approach speed increased by 20 KIAS as compared with the flaps DN approach speed (Fig. 9-137).
Lower the landing gear.
After touchdown, engage reverse when the propeller speed has dropped to 1900 RPM.
The landing distance, as compared with the flaps DN landing distance (Fig. 9-137), will increase approximately by 65% if the reverse thrust is not applied or by 55% if reverse thrust is applied.

The procedure just described applies also when operating in sustained icing conditions with the exception that the approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 20 KIAS.
The landing distance, as compared with the flaps MID landing distance (Fig. 9-141), must be increased approximately by 40% if reverse thrust is not applied or by 30% if reverse thrust is applied.

SECTION 4 – NORMAL PROCEDURES

4.1 AIRSPEEDS FOR NORMAL OPERATIONS

	SPEED	KIAS
b.	Two engines Best Angle of Climb Speed	135
c.	Two engines Best Rate of Climb Speed	157
d.	Two engines Approach Speed at Maximum Landing Weight	
	Flap MID	132
	Flap DN	125
e.	Balked Landing Climb Speed at Maximum Landing Weight	
	Flap MID	132
	Flap DN	125
i.	Design Maneuvering Speed	
	At 12100 lb	202
	At 7700 lb	177
k.	Maximum Flap Extended Speed	
	Flap MID	183
	Flap DN	177
l.	Maximum Landing gear Operating Speed	181
p.	Rough Air Penetration Speed at or below 25000 ft. Reduce speed 5 KIAS for each 5000 ft above 25000 ft.	200
q.	Minimum Speed for Intentional One Engine Inoperative	140

4.2 NORMAL PROCEDURES CHECKLIST

4.2.4 BEFORE TAXI

No changes except for the following:

WARNING

Do not operate engine inlet de-ice boots below –40°C.

No takeoff authorized with frost, snow or ice adhering to propellers, windshields, powerplant installation and pitot/static ports, or with frost, snow or ice adhering to the wings, vertical and horizontal stabilizer or control surfaces.

4.2.8 TAKEOFF

1. Power levers - ADVANCE to MAXIMUM TAKE-OFF power

WARNING

Before applying full power, be sure that the condition levers are set to MAX RPM: takeoff distance given in Sec. 5 may not be assured.

2. Autofeather - CHECK ARMED (green AUTOFEATHER lights ON)

WARNING

If ambient temperature is below –25°C, it is necessary to operate the main wing anti-ice and the engine ice vane systems before applying full power to ensure that the autofeather is armed.
When takeoff is completed and autofeather disengaged, the ice protection can be switched OFF.

3. Engine gauges - WITHIN LIMITS
4. Steering (not over 60 KIAS) - OFF
5. Rotation - REFER to Section 5 of this Supplement, Fig. 9-87
6. Airspeed - Accelerate to 126 KIAS until above 50 ft.
7. Taxi/landing lights (below 160 KIAS) - OFF
8. Gear (below 180 KIAS) - UP
9. Autofeather (above 150 KIAS) - OFF
10. Flaps (below 170 KIAS) - UP

4.2.13 LANDING

Prior to reaching 50 ft. above landing surface:

11. Landing gear - CHECK DN (3 green lights)
12. Flaps - CHECK DN

CAUTION

When operating in icing conditions, the landing procedure must be performed with flaps MID and the approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 6 KIAS.

Steering engagement during landing is prohibited.

NOTE

The landing distance with flaps MID (Fig. 9-141) must be increased approximately by 10% if reverse thrust is not applied or by 5% if reverse thrust is applied.

13. Approach speed - REFER to Section 5 of this Supplement Fig. 9-137
14. Power - AS REQUIRED
15. Condition levers - CHECK MAX RPM

After touchdown:

16. Brakes - AS REQUIRED
17. Reverse - AS REQUIRED; engage reverse below 1900 prop RPM or 5% drop from the set value

NOTE

When landing at aft C.G. initiate flaps retraction before actuating reverse power.

18. Reverse - AVOID USE below 40 KIAS, approximately.

At landing completed:

19. Condition levers - GROUND IDLE
20. Steering - ENGAGE TAKE OFF (if necessary)

4.2.14 BALKED LANDING

1. Power levers - Apply Balked Landing climb torque as per Fig. 9-135 (Flap DN) or Fig. 9-139 (Flap MID)
2. Engine gauges - WITHIN LIMITS
3. Airspeed - 125 KIAS
4. Flaps (below 150 KIAS) - MID

CAUTION

When operating in icing conditions, the balked landing procedure must be performed with flaps MID and the airspeed must be 138 KIAS.

5. Gear (after climb established) - UP
6. Flaps (below 170 KIAS) - UP
7. Airspeed - 160 KIAS

4.2.18 OPERATION IN ICING CONDITIONS

WEATHER CONDITIONS THAT MAY BE CONDUCIVE TO SEVERE IN-FLIGHT ICING

WARNING

If unusual ice (e.g. unusual runback ice) is observed forming aft of the protected surfaces of the wing or if unusual lateral trim requirements or autopilot trim warnings are encountered, accomplish the following:

- If the flaps are extended, do not retract them until the airframe is clear of ice.
- The flight crew should reduce the angle-of-attack by increasing speed as much as the airplane configuration and weather allow, without exceeding design maneuvering speed.
- If the autopilot is engaged, hold the control wheel firmly and disengage the autopilot. Do not re-engage the autopilot until the airframe is clear of ice.
- Exit the icing area immediately by changing altitude or course; and
- Report these weather conditions to air traffic control.

CAUTION

Flight in freezing rain, freezing drizzle, or mixed icing conditions (supercooled liquid water and ice crystals) may result in hazardous ice build-up on protected surfaces exceeding the capability of the ice protection system, and it may seriously degrade the performance and controllability of the airplane.

The following **shall** be used to identify freezing rain/freezing drizzle icing conditions:

a. Unusually extensive ice accreted on the airframe in areas not normally observed to collect ice.

b. Unusual accumulation of ice on the surfaces of the wings aft of the protected area.

The following **may** be used to identify possible freezing rain/freezing drizzle conditions:

a. Visible rain at temperatures below +5°C outside air temperature (OAT).

b. Droplets that splash or splatter on impact at temperatures below +5°C OAT.

c. Performance losses larger than normally encountered in icing conditions. It is possible to experience severe ice accretions not visible to the flight crew, such as wing ice accretion on the non visible wing surface.

PROCEDURES FOR EXITING THE FREEZING RAIN/FREEZING DRIZZLE ENVIRONMENT

These procedures are applicable to all flight phases from takeoff to landing. Monitor the outside air temperature. While ice may form in freezing drizzle or freezing rain at temperatures as cold as –18°C, increased vigilance is warranted at temperatures around freezing with visible moisture present.
If the visual cues specified in this Supplement for identifying possible freezing rain or freezing drizzle conditions are observed, accomplish the following:

a. Exit the freezing rain or freezing drizzle icing conditions immediately to avoid extended exposure to flight conditions outside of those for which the airplane has been certificated for operation. Asking for priority to leave the area is fully justified under these conditions.
b. Avoid abrupt and excessive maneuvering that may exacerbate control difficulties.
c. Do not engage the autopilot. The autopilot may mask unusual control system forces.
d. If the autopilot is engaged, hold the control wheel firmly and disengage the autopilot.
e. If an unusual roll response or uncommanded control movement is observed, reduce the angle-of-attack by increasing airspeed or rolling wings level (if in a turn), and apply additional power, if needed.
f. Avoid extending flaps during extended operation in icing conditions. Operation with flaps extended can result in a reduced wing angle-of-attack, with unusual ice forming on the upper surface further aft on the wing than normal.
g. If the flaps are extended, do not retract them until the airframe is clear of ice.
h. Report these weather conditions to ATC.

CLIMB PERFORMANCE

NOTE

If the power cannot be reset and if the ice accretion on the unprotected parts corresponds to one inch approximately on the main wing tips, the following may result:

a. the normal two engines rate/gradient of climb (Fig. 9-97 and Fig. 9-98) will be reduced by 800 ft/min. at sea level and 1800 ft/min. at 20000 feet and the ceiling will be approximately 24000 feet.
b. the normal single engine rate/gradient of climb (Fig. 9-104 and Fig. 9-105) will be reduced by 500 ft/min. at sea level and 700 ft/min. at 10000 feet and the ceiling will be approximately 5000 feet.

LANDING PERFORMANCE

WARNING

The icing limitation requiring flaps in MID position for landing is necessary since landing with flaps DN, with heavy residual ice accumulation, may result in a decrease of longitudinal stability or limited trim capability if the C.G. position is, respectively, fully aft or forward.

The balked landing climbing speed, with flaps in MID position is 138 KIAS: if the power cannot be reset and if the ice accretion on the unprotected parts corresponds to three inches approximately on the main wing tips, the balked landing rate of climb with flaps in MID position (Fig. 9-140) will be reduced by 1350 ft/min. maximum.

The approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 6 KIAS. The landing distance with flaps in MID position will be increased approximately by 10%.

4.3 AMPLIFIED NORMAL PROCEDURES

4.3.4 BEFORE TAXI

No changes except for the following:

WARNING

Do not operate engine inlet de-ice boots below –40°C.

No takeoff authorized with frost, snow or ice adhering to propellers, windshields, powerplant installation and pitot/static ports, or with frost, snow or ice adhering to the wings, vertical and horizontal stabilizer or control surfaces.

4.3.8 TAKEOFF

Hold the brakes and advance power lever until about 2000 ft-lb torque.

WARNING

Before applying full power, be sure the condition levers are set to MAX RPM. Disattending this procedure, a remarkable increment of ground roll will result.

Check autofeather armed (green AUTOFEATHER lights illuminated), release brakes, increase power up to 2150 lb.ft. and check engine instruments.

NOTE

Torque limit of 2150 lb.ft. is the static value to be applied for takeoff in order to obtain the normal 2230 lb.ft. at takeoff speed for ram effect during the takeoff run.

WARNING

If ambient temperature is below –25°C, it is necessary to operate the main wing anti-ice and the engine ice vane systems before applying full power to ensure that the autofeather is armed.
When takeoff is completed and autofeather disengaged, the ice protection can be switched OFF.

At low ambient temperature (below – 25°C), in order to ensure that the autofeather is armed, it is necessary to select, on the ANTI ICE panel, AUTO position for L/R MAIN WING and L and R position for ENG ICE VANE/OIL COOL INTK switches.

When takeoff is completed and the autofeather system disengaged, the wing and engine anti ice systems can be switched OFF. As the aircraft accelerates, an increase in torque at a fixed power lever position is normal. Adjust power setting as required to maintain engine gauges within limits.
Disengage steering not over 60 KIAS. Before rotation attain a minimum airspeed as per Fig. 9-87.
Rotate approximately between 10° to 15° nose up according to the weight and, after lift off, accelerate to and maintain an airspeed of 126 KIAS until above 50 ft. Below 160 KIAS switch off the taxi/landing lights, if applicable, and check LTS DOOR OPEN green advisory light off.
Retract landing gear below 180 KIAS and flaps below 170 KIAS. Do not retract the landing gear prematurely.
Disengage the autofeather system above 150 KIAS.

4.3.13 LANDING

Prior to reaching 50 ft above landing surface verify that the gear and flaps are down.
Assume an approach speed as per Fig. 9-137.

CAUTION

When operating in icing conditions, the landing procedure must be performed with flaps MID and the approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 6 KIAS.

Steering engagement during landing is prohibited.

The landing distance with flaps MID (Fig. 9-141) must be increased approximately by 10% if reverse thrust is not applied or by 5% if reverse thrust is applied.
For more information about airplane operation in icing conditions consult para. 4.3.23 of the basic AFM and of this Supplement.

Use power as required and reduce during the flare, check condition lever for MAX RPM.
After touch down use brakes and reverse as required.
Engage reverse thrust below 1900 prop RPM, or 5% drop from the set value, and disengage when the speed has decreased to about 40 KIAS, in order to avoid damages to the propellers.

NOTE

When landing at aft C.G. initiate flaps retraction before actuating reverse power.

When landing at light weights, use caution when applying brakes, as excessive pedal pressure will result in skidding the tires with a resultant loss in braking effectiveness.

When landing is completed and reverse has been disengaged retard the condition levers to GROUND IDLE.
Engage Steering in TAKE OFF mode (if necessary).

4.3.14 BALKED LANDING

In a balked landing situation, apply Balked Landing climb torque as per Fig. 9-135 (Flap DN) or Fig. 9-139 (Flap MID), maintain torque and engine temperature within allowable limits.
Maintain an airspeed of 125 KIAS.

CAUTION

When operating in icing conditions, the landing procedure must be performed with flaps MID.

The balked landing speed, in icing conditions, with flaps MID is 138 KIAS.

For more information about airplane operation in icing conditions consult para. 4.3.23 of the basic AFM and of this Supplement.

After climb is established, accelerate the airplane then retract the flaps to MID (below 150 KIAS), retract the landing gear, then retract flap to UP position (below 170 KIAS).

Accelerate to and maintain a speed of 160 KIAS.

4.3.19 V_{MCA} - AIR MINIMUM CONTROL SPEED

V_{MCA} is the minimum flight speed at which a twin-engine airplane is directionally controllable as determined in accordance with the EASA CS 23 Certification Regulations. Airplane certification conditions include one engine inoperative and propeller windmilling; not more than a 5° bank toward the operative engine; flaps take-off with landing gear up and flaps landing gear down configurations and most rearward center of gravity.

V_{MCA} has been determined to be 100 KIAS with the propeller feathered, for both takeoff and landing configurations, and 128 KIAS with propeller windmilling.

4.3.21 ROUGH AIR OPERATION

In condition of extreme turbulence, slow the airplane to Rough Air Penetration Speed of 200 KIAS at or below 25000 ft.

PIAGGIO AERO

4.3.23 OPERATION IN ICING CONDITIONS

WEATHER CONDITIONS THAT MAY BE CONDUCIVE TO SEVERE IN-FLIGHT ICING

WARNING

If unusual ice (e.g. unusual runback ice) is observed forming aft of the protected surfaces of the wing or if unusual lateral trim requirements or autopilot trim warnings are encountered, accomplish the following:

- If the flaps are extended, do not retract them until the airframe is clear of ice.
- The flight crew should reduce the angle-of-attack by increasing speed as much as the airplane configuration and weather allow, without exceeding design maneuvering speed.
- If the autopilot is engaged, hold the control wheel firmly and disengage the autopilot. Do not re-engage the autopilot until the airframe is clear of ice.
- Exit the icing area immediately by changing altitude or course; and
- Report these weather conditions to air traffic control.

CAUTION

Flight in freezing rain, freezing drizzle, or mixed icing conditions (supercooled liquid water and ice crystals) may result in hazardous ice build-up on protected surfaces exceeding the capability of the ice protection system, and it may seriously degrade the performance and controllability of the airplane.

The following **shall** be used to identify freezing rain/freezing drizzle icing conditions:

a. Unusually extensive ice accreted on the airframe in areas not normally observed to collect ice.

b. Unusual accumulation of ice on the surfaces of the wings aft of the protected area.

The following **may** be used to identify possible freezing rain/freezing drizzle conditions:

a. Visible rain at temperatures below +5°C outside air temperature (OAT).

b. Droplets that splash or splatter on impact at temperatures below +5°C OAT.

c. Performance losses larger than normally encountered in icing conditions. It is possible to experience severe ice accretions not visible to the flight crew, such as wing ice accretion on the non visible wing surface.

PROCEDURES FOR EXITING THE FREEZING RAIN/FREEZING DRIZZLE ENVIRONMENT

These procedures are applicable to all flight phases from takeoff to landing. Monitor the outside air temperature. While ice may form in freezing drizzle or freezing rain at temperatures as cold as –18°C, increased vigilance is warranted at temperatures around freezing with visible moisture present.
If the visual cues specified in this Supplement for identifying possible freezing rain or freezing drizzle conditions are observed, accomplish the following:

a. Exit the freezing rain or freezing drizzle icing conditions immediately to avoid extended exposure to flight conditions outside of those for which the airplane has been certificated for operation. Asking for priority to leave the area is fully justified under these conditions.

b. Avoid abrupt and excessive maneuvering that may exacerbate control difficulties.

c. Do not engage the autopilot. The autopilot may mask unusual control system forces.

d. If the autopilot is engaged, hold the control wheel firmly and disengage the autopilot.

e. If an unusual roll response or uncommanded control movement is observed, reduce the angle-of-attack by increasing airspeed or rolling wings level (if in a turn), and apply additional power, if needed.

f. Avoid extending flaps during extended operation in icing conditions. Operation with flaps extended can result in a reduced wing angle-of-attack, with unusual ice forming on the upper surface further aft on the wing than normal.

g. If the flaps are extended, do not retract them until the airframe is clear of ice.

h. Report these weather conditions to ATC.

CLIMB PERFORMANCE

If the power cannot be reset and if the ice accretion on the unprotected parts corresponds to one inch approximately on the main wing tips, the following may result:

a. the normal two engines rate/gradient of climb (Fig. 9-97 and Fig. 9-98) will be reduced by 800 ft/min. at sea level and 1800 ft/min. at 20000 feet and the ceiling will be approximately 24000 feet.

b. the normal single engine rate/gradient of climb (Fig. 9-104 and Fig. 9-105) will be reduced by 500 ft/min. at sea level and 700 ft/min. at 10000 feet and the ceiling will be approximately 5000 feet.

LANDING PERFORMANCE

WARNING

The icing limitation requiring flaps in MID position for landing is necessary since landing with flaps DN, with heavy residual ice accumulation, may result in a decrease of longitudinal stability or limited trim capability if the C.G. position is, respectively, fully aft or forward.

The balked landing climbing speed, with flaps in MID position is 138 KIAS: if the power cannot be reset and if the ice accretion on the unprotected parts corresponds to three inches approximately on the main wing tips, the balked landing rate of climb with flaps in MID position (Fig. 9-140) will be reduced by 1350 ft/min. maximum.

The approach speed, as compared with the flaps MID approach speed (Fig. 9-141), must be increased by 6 KIAS. The landing distance with flaps in MID position will be increased approximately by 10%.

PIAGGIO AERO

CAT II OPERATIONS

APPLICABLE TO SUPPLEMENT N. 26 "CATEGORY II OPERATIONS"

SECTION 4 - NORMAL PROCEDURES

AIRSPEEDS FOR NORMAL OPERATIONS

	SPEED KIAS Two engines Approach Speed for CAT II operations (V_{REF}):
FLAP MID	
At 11500 lbs (5216 kg) weight	132
At 10945 lbs (4965 kg) weight	129
At 10270 lbs (4658 kg) weight or below	125
FLAP DN	
At 11500 lbs (5216 kg) weight	130
At 10945 lbs (4965 kg) weight	125
At 10270 lbs (4658 kg) weight or below	121

APPROACH AND LANDING PREPARATION

At DH (Decision Height Certified for CAT II):

If Go Around is decided:

- GA Push Button - DEPRESS
- Power setting - FULL POWER
- Autopilot - VERIFY LVL and GA GREEN LIGHTS ON
- Aircraft - MONITOR ATTITUDE AND BANK
- Two-engines go around speed - MAINTAIN (125 KIAS minimum)

CAUTION

When operating in icing conditions, the landing procedure must be performed with flaps MID. In this condition the go around speed is 138 KIAS.

- Airplane Configuration - AS REQUIRED

SECTION 5 – PERFORMANCE

5.0 GENERAL

List of EASA approved figures:
9-83, 9-84, 9-85, 9-86, 9-87, 9-91, 9-93, 9-94, 9-95, 9-97, 9-98, 9-102, 9-104, 9-105, 9-135, 9-137, 9-139, 9-141, 9-143.

NOTE

EASA approved figures 9-85, 9-91, 9-95, 9-102, 9-135 and 9-139 are equivalent to the corresponding figures in the basic Pilot's Operating Handbook and Airplane Flight Manual and are not affected by weight; these figures are included in this supplement for pilot's convenience and in order to maintain the operative sequence.

RAI/ENAC approved figure 5-15 of the basic Pilot's Operating Handbook and Airplane Flight Manual is no more applicable.

EASA not approved figures are 9-88, 9-89, 9-90, 9-92, 9-96, 9-99, 9-100, 9-101, 9-103, 9-106, from 9-107 to 9-134, 9-136, 9-138, 9-140 and 9-142, and are included in this Supplement for pilot's convenience and arranged in a reasonable operative sequence.

	WEIGHT 12,100 LBS (5490 KGS)					
BANK ANGLE	FLAPS UP		FLAPS MID		FLAPS DN	
DEG	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
0	114	113	106	104	99	98
10	115	114	106	105	99	99
20	118	116	109	108	102	101
30	123	121	113	112	106	105
40	130	129	120	119	113	112
50	142	141	131	130	123	122
60	161	160	149	147	139	139

Associated conditions:

Idle Power - Forward C.G. Gear position has no effect on stalling speeds.

Maximum Altitude loss during stall is 1,000 FT.

Note:

The values are valid for Pilot's analogic instrumentation with ADC

	WEIGHT 11,551 LBS (5240 KGS)					
BANK ANGLE	FLAPS UP		FLAPS MID		FLAPS DN	
DEG	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
0	112	110	104	102	98	96
10	113	111	105	103	99	97
20	115	114	107	105	101	100
30	120	119	111	109	105	104
40	128	126	118	116	112	110
50	139	138	129	127	122	120
60	158	156	146	144	138	136

Figure 9-83. STALL SPEED
(For lower weights refer to Fig. 5-14 of the basic AFM/POH)

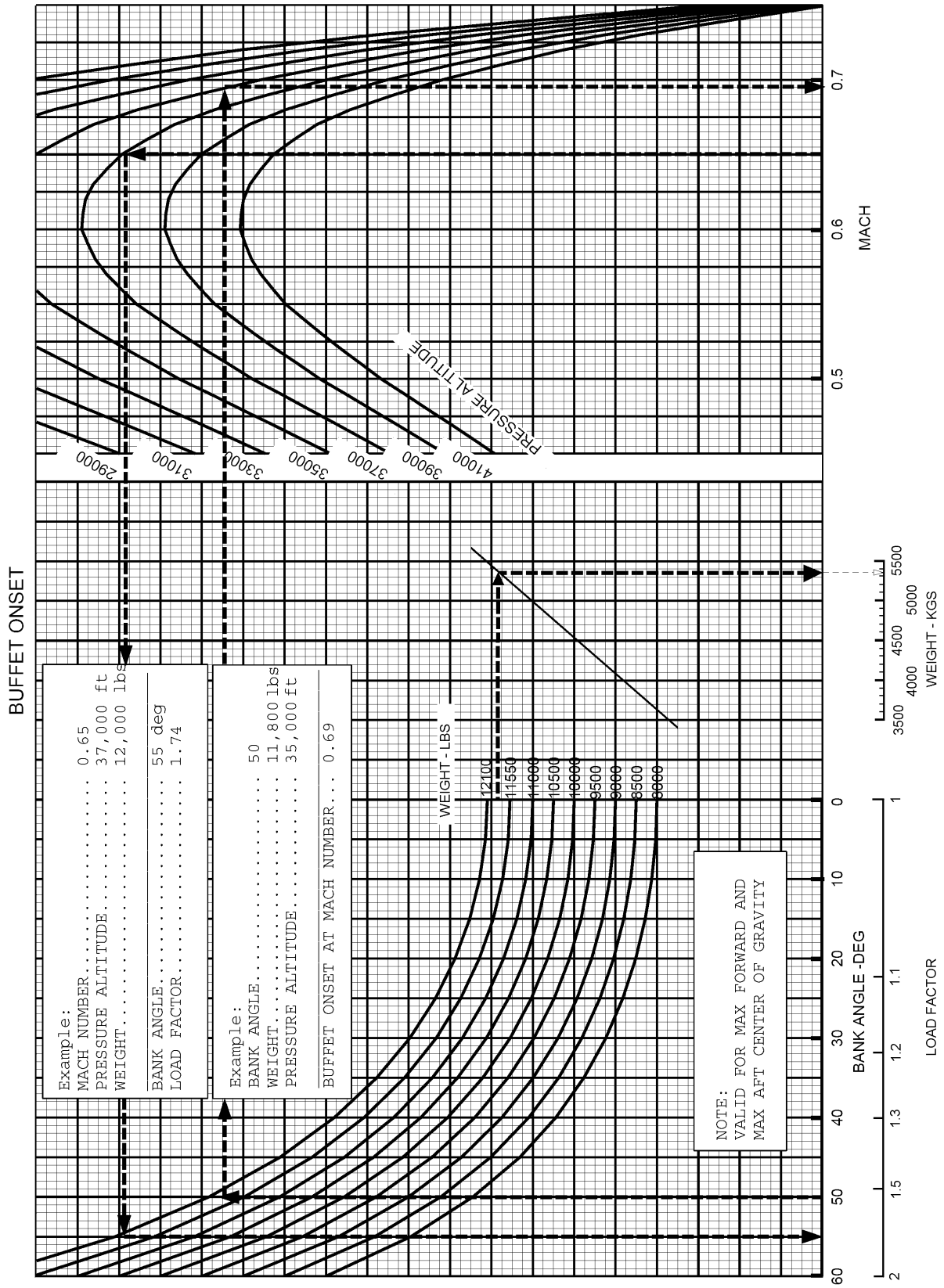
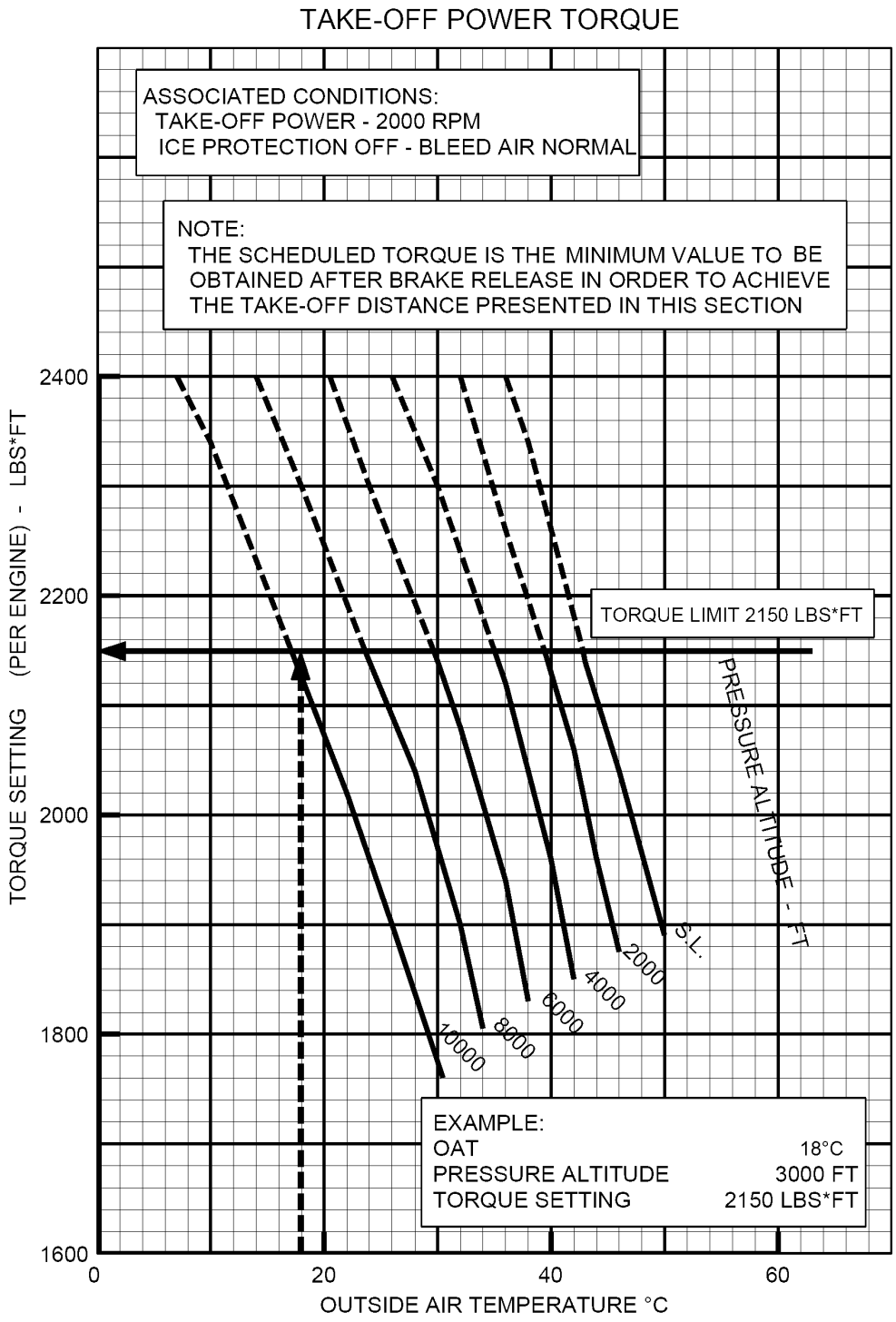


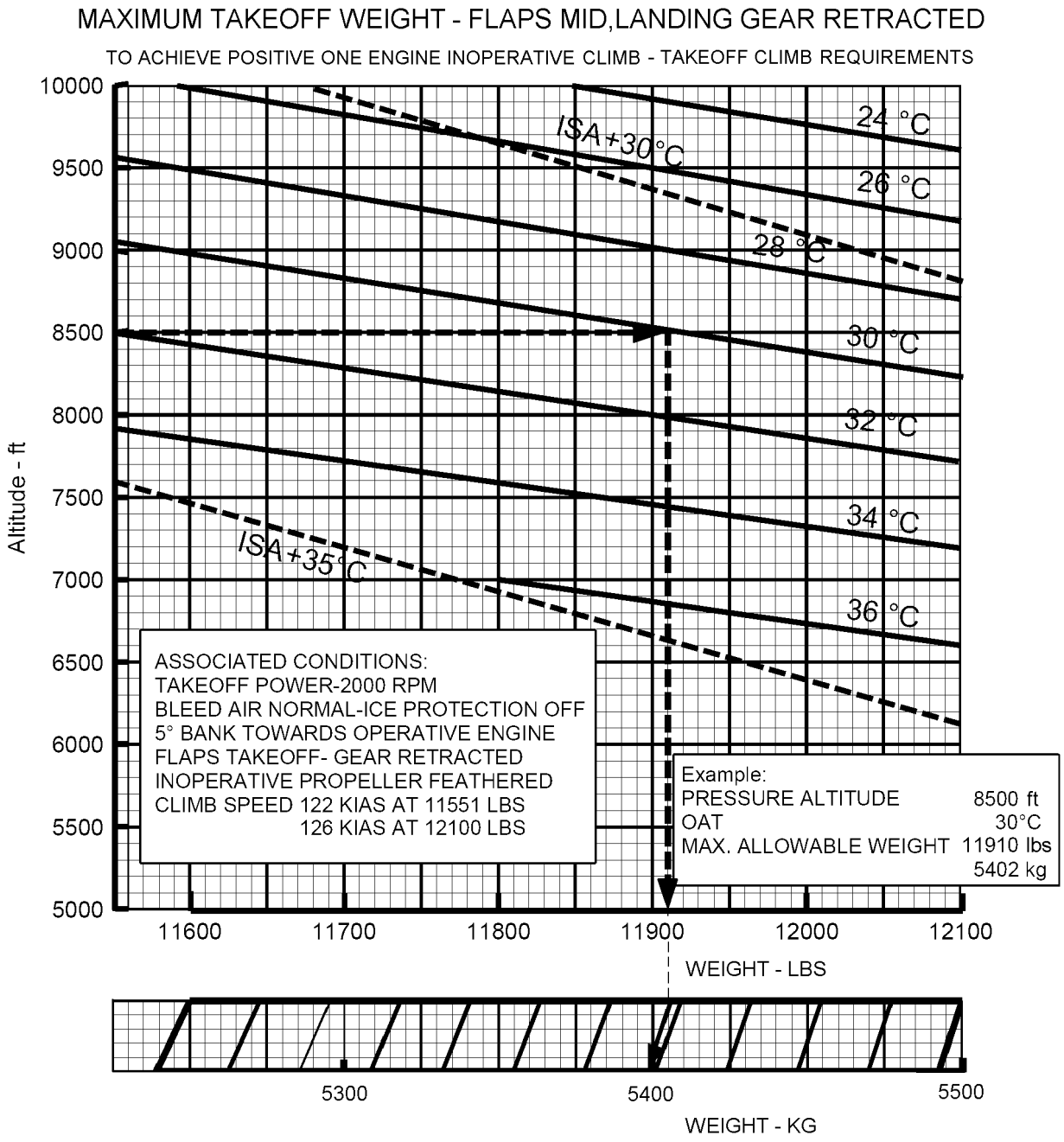
Figure 9-84. BUFFET ONSET LIMITS
(This figure supersedes Fig. 5-15 of the basic AFM/POH)



NOTE

Torque limit of 2150 lb.ft is the static value to be applied for takeoff in order to obtain the normal 2230 lb.ft at takeoff speed for ram effect during the takeoff run.

Figure 9-85. TAKE OFF POWER TORQUE
(Equivalent to Fig. 5-17 of the basic AFM/POH)



NOTE

When operating in icing conditions add 22°C to the OAT before entering this graph.

Figure 9-86. MAXIMUM TAKEOFF WEIGHT TO ACHIEVE ONE ENGINE INOPERATIVE - TAKEOFF CLIMB REQUIREMENTS - FLAPS MID, LANDING GEAR RETRACTED

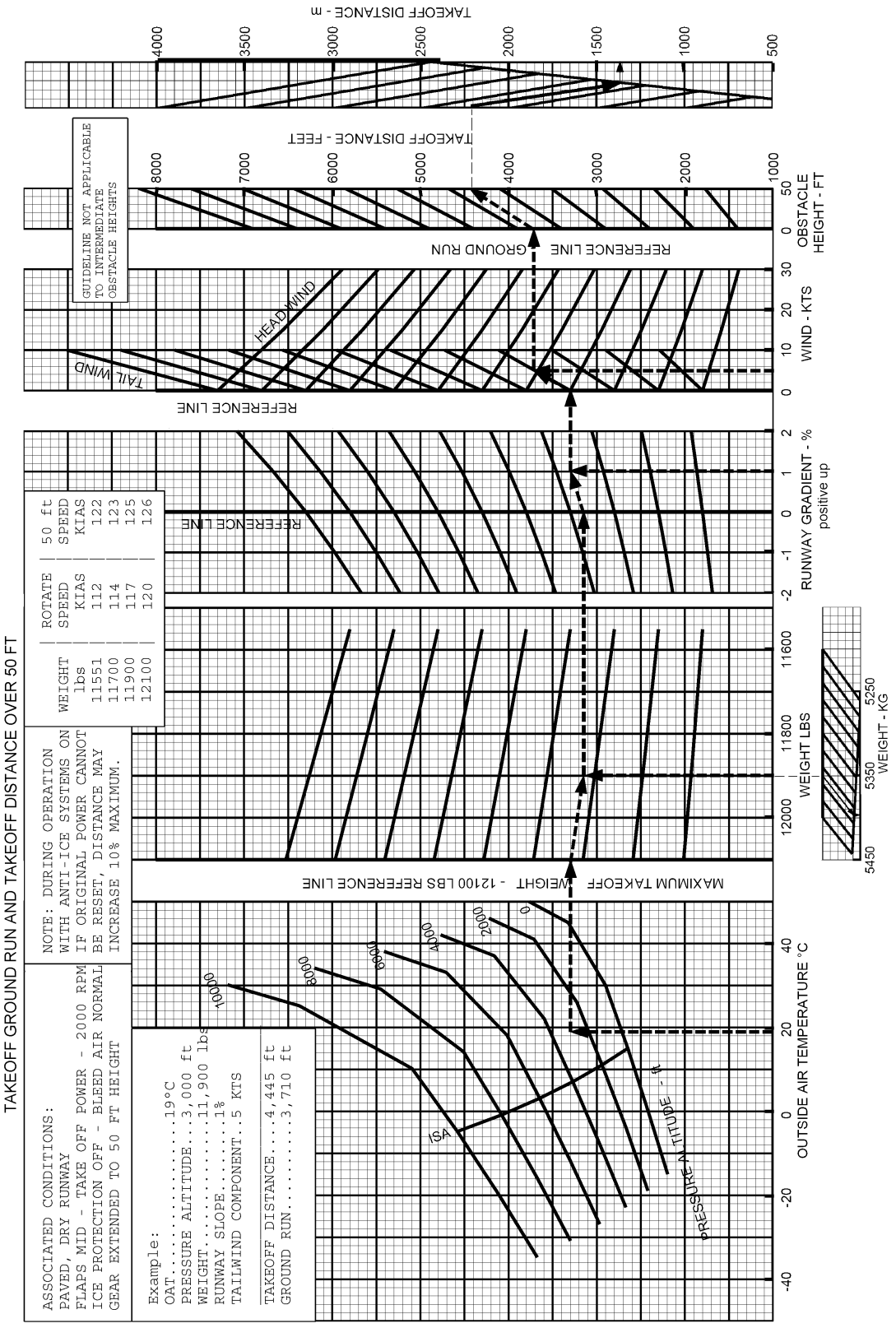


Figure 9-87. TAKEOFF GROUND RUN AND TAKEOFF DISTANCE OVER 50 FEET (For lower weights refer to Fig. 5-19 and 5-20 of the basic AFM/POH)

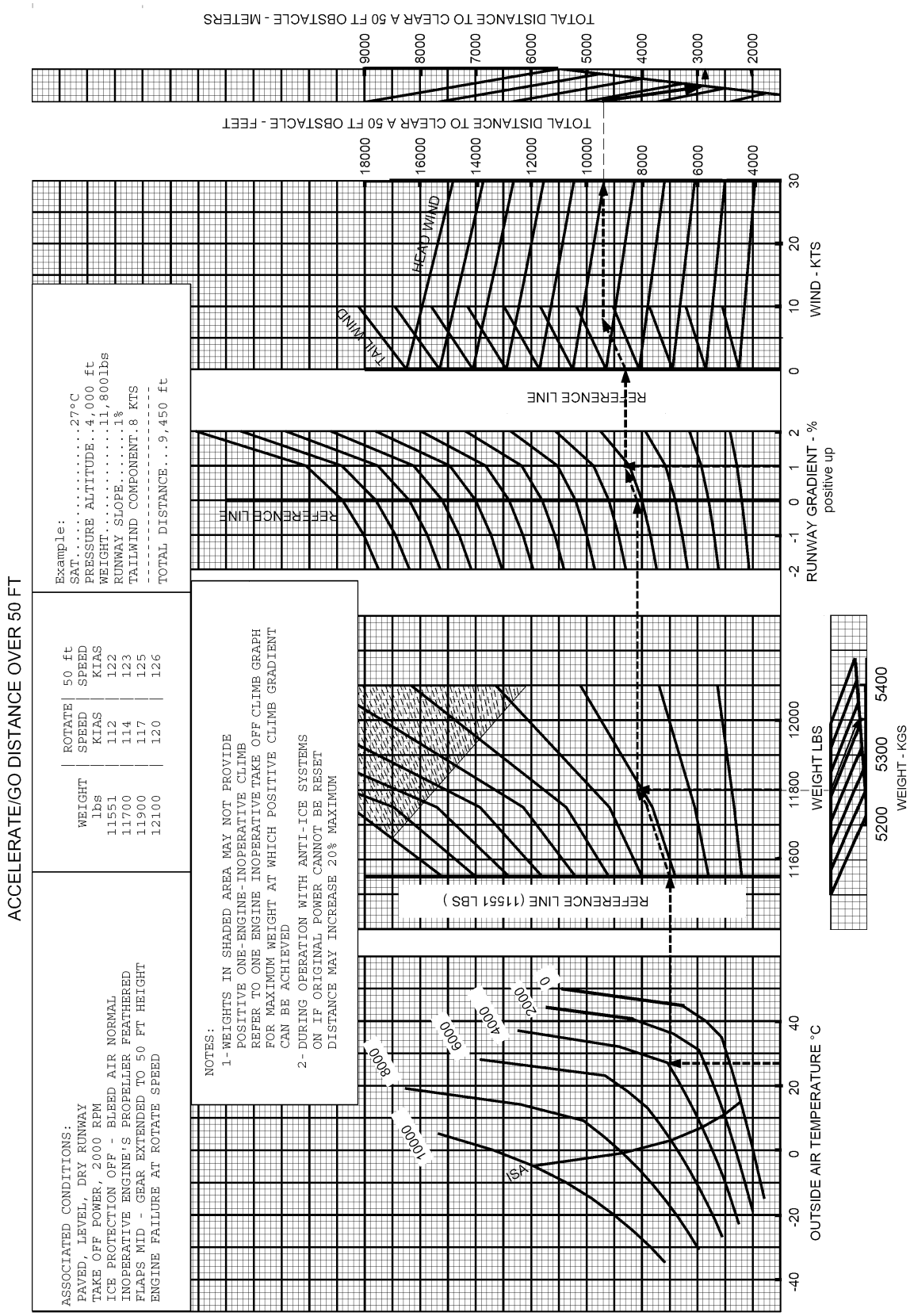

ACCELERATE/GO DISTANCE OVER 50 FT
ASSOCIATED CONDITIONS:
PAVED, LEVEL, DRY RUNWAY
TAKE OFF POWER, 2000 RPM
ICE PROTECTION OFF - BLEED AIR NORMAL
INOPERATIVE ENGINE'S PROPELLER FEATHERED
FLAPS MID - GEAR EXTENDED TO 50 FT HEIGHT
ENGINE FAILURE AT ROTATE SPEED
WEIGHT lbs | ROTATE SPEED KIAS | 50 ft SPEED KIAS
11551 | 112 | 122
11700 | 114 | 123
11900 | 117 | 125
12100 | 120 | 126
NOTES:
1-WEIGHTS IN SHADED AREA MAY NOT PROVIDE POSITIVE ONE-ENGINE-INOPERATIVE CLIMB REFER TO ONE ENGINE INOPERATIVE TAKE OFF CLIMB GRAPH FOR MAXIMUM WEIGHT AT WHICH POSITIVE CLIMB GRADIENT CAN BE ACHIEVED
2-DURING OPERATION WITH ANTI-ICE SYSTEMS ON IF ORIGINAL POWER CANNOT BE RESET DISTANCE MAY INCREASE 20% MAXIMUM
Example:
SAT.....27°C
PRESSURE ALTITUDE..4,000 ft
WEIGHT.....11,800lbs
RUNWAY SLOPE.....1%
TAILWIND COMPONENT.8 KTS
TOTAL DISTANCE...9,450 ft
REFERENCE LINE (11551 LBS)
REFERENCE LINE
REFERENCE LINE
TAIL WIND
HEAD WIND
ISA
0
2000
4000
6000
8000
10000
OUTSIDE AIR TEMPERATURE °C
WEIGHT LBS
WEIGHT - KGS
RUNWAY GRADIENT - % positive up
WIND - KTS
TOTAL DISTANCE TO CLEAR A 50 FT OBSTACLE - FEET
TOTAL DISTANCE TO CLEAR A 50 FT OBSTACLE - METERS

Figure 9-88. ACCELERATE AND GO DISTANCE OVER 50 FEET (For lower weights refer to Fig. 5-21 of the basic AFM/POH)

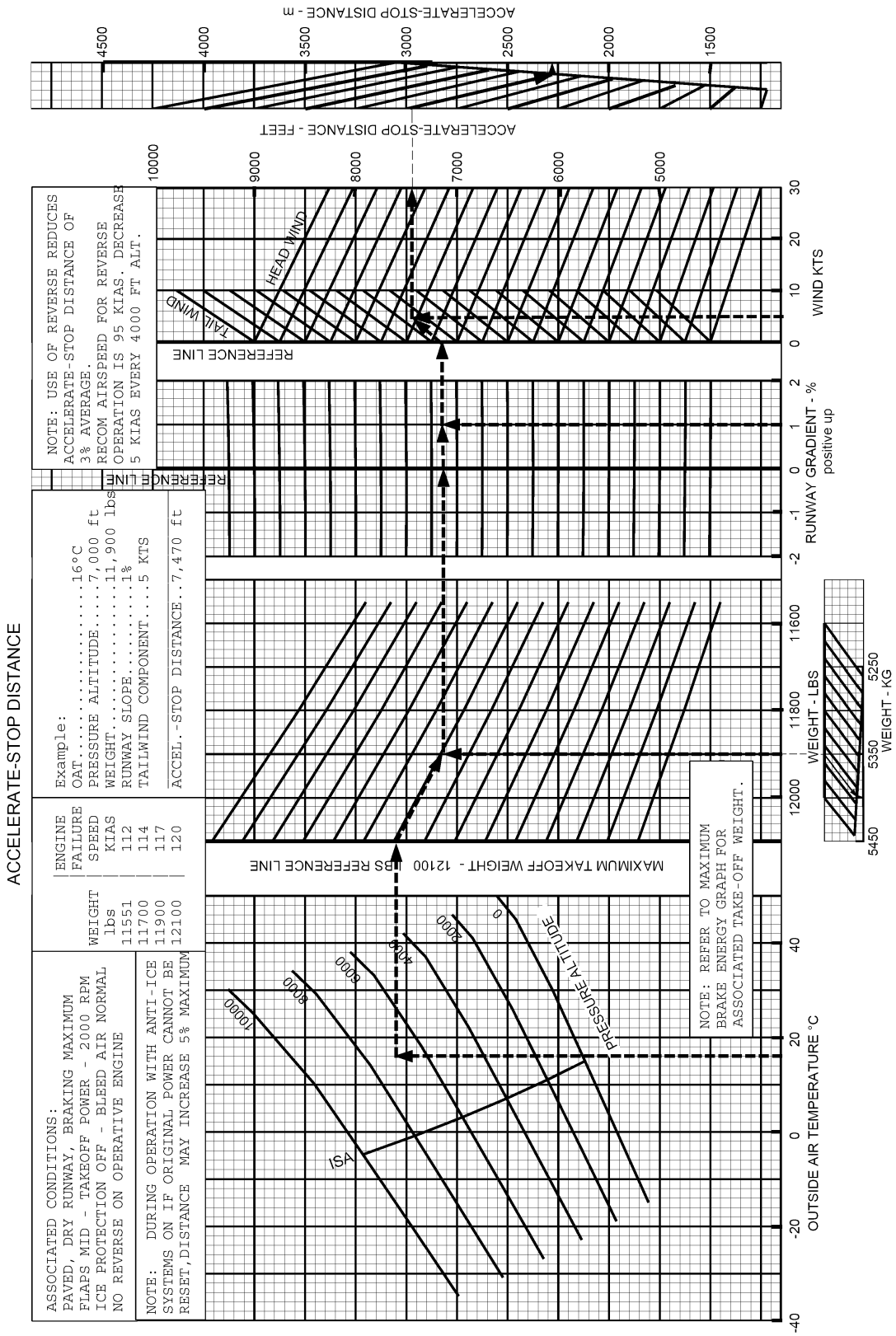

ACCELERATE-STOP DISTANCE
ACCELERATE-STOP DISTANCE - m
ACCELERATE-STOP DISTANCE - FEET
HEAD WIND
TAIL WIND
REFERENCE LINE
WIND KTS
RUNWAY GRADIENT - % positive up
WEIGHT - LBS
WEIGHT - KG
OUTSIDE AIR TEMPERATURE °C
PRESSURE ALTITUDE
MAXIMUM TAKEOFF WEIGHT - 12100 LBS REFERENCE LINE
NOTE: USE OF REVERSE REDUCES ACCELERATE-STOP DISTANCE OF 3% AVERAGE. RECOM AIRSPEED FOR REVERSE OPERATION IS 95 KIAS. DECREASE 5 KIAS EVERY 4000 FT ALT.
Example:
OAT.....16°C
PRESSURE ALTITUDE.....7,000 ft
WEIGHT.....11,900 lbs
RUNWAY SLOPE.....1%
TAILWIND COMPONENT....5 KTS
ACCEL.-STOP DISTANCE..7,470 ft
ENGINE FAILURE SPEED KIAS
WEIGHT lbs
11551 112
11700 114
11900 117
12100 120
ASSOCIATED CONDITIONS:
PAVED, DRY RUNWAY, BRAKING MAXIMUM
FLAPS MID - TAKEOFF POWER - 2000 RPM
ICE PROTECTION OFF - BLEED AIR NORMAL
NO REVERSE ON OPERATIVE ENGINE
NOTE: DURING OPERATION WITH ANTI-ICE SYSTEMS ON IF ORIGINAL POWER CANNOT BE RESET, DISTANCE MAY INCREASE 5% MAXIMUM
NOTE: REFER TO MAXIMUM BRAKE ENERGY GRAPH FOR ASSOCIATED TAKE-OFF WEIGHT.

Figure 9-89. ACCELERATE AND STOP DISTANCE
(For lower weights refer to Fig. 5-22 of the basic AFM/POH)

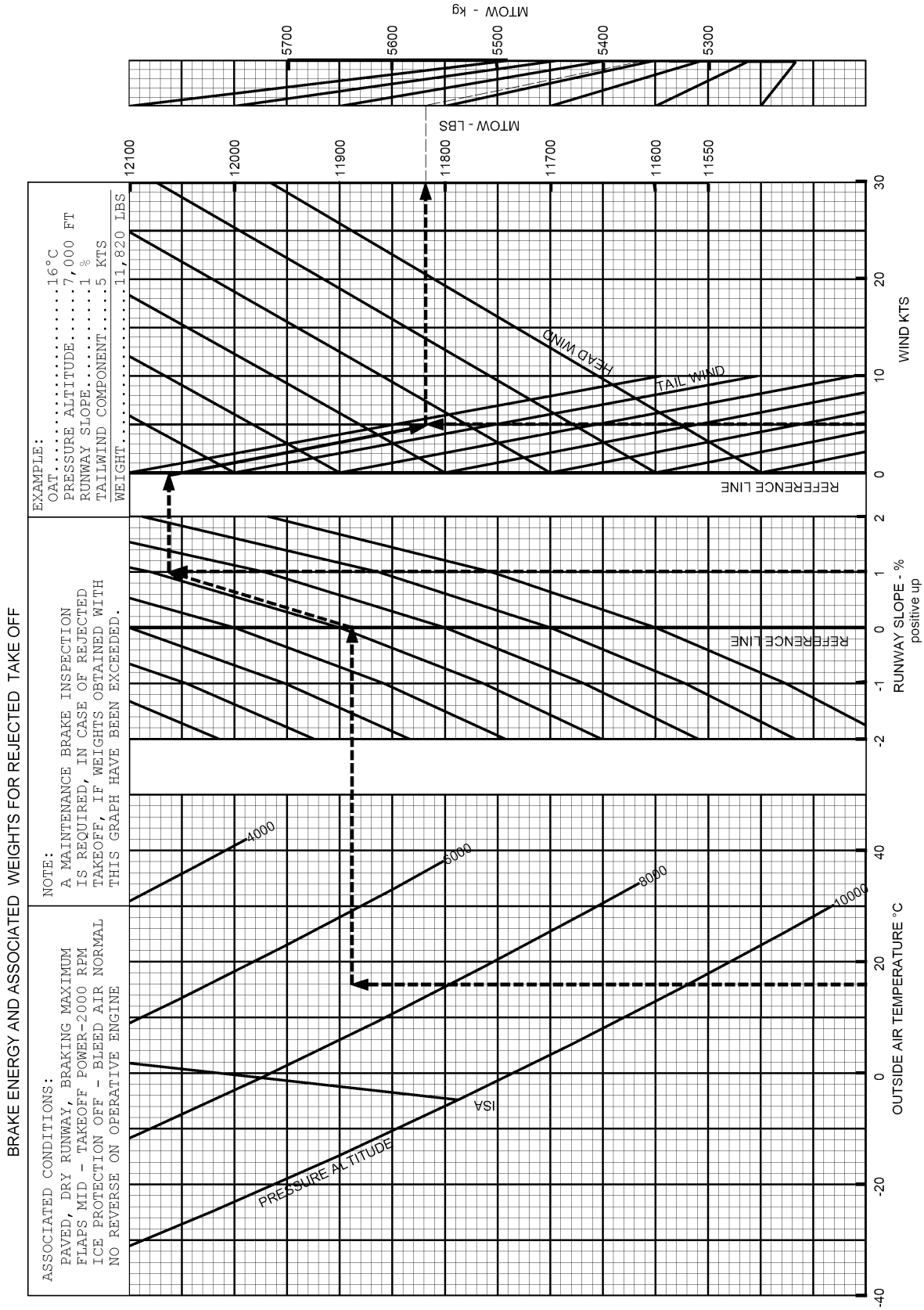


Figure 9-90. BRAKE ENERGY AND ASSOCIATED WEIGHTS FOR REJECTED TAKE OFF

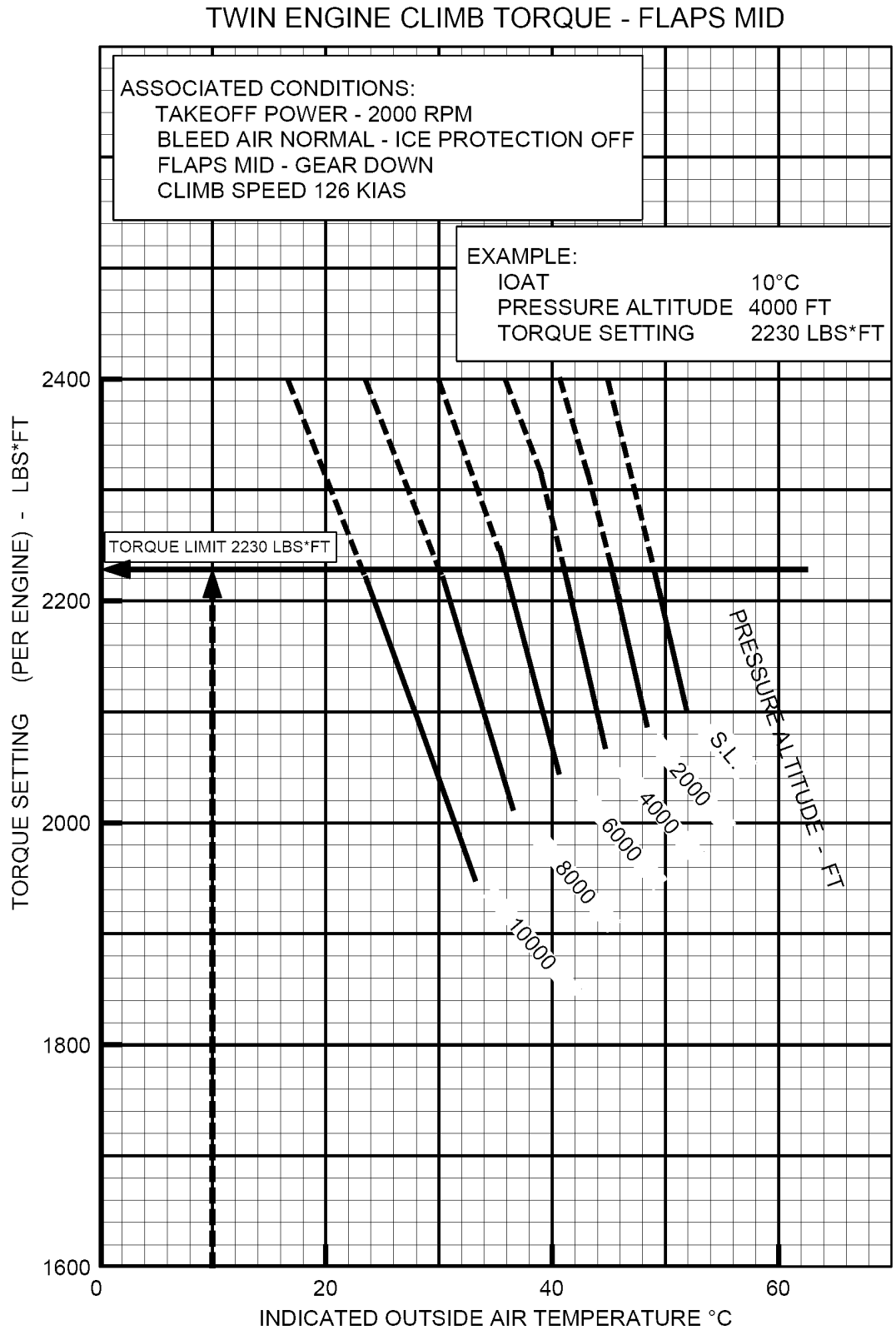


Figure 9-91. TWIN ENGINE CLIMB TORQUE - FLAPS MID
(Equivalent to Fig. 5-24 of the basic AFM/POH)

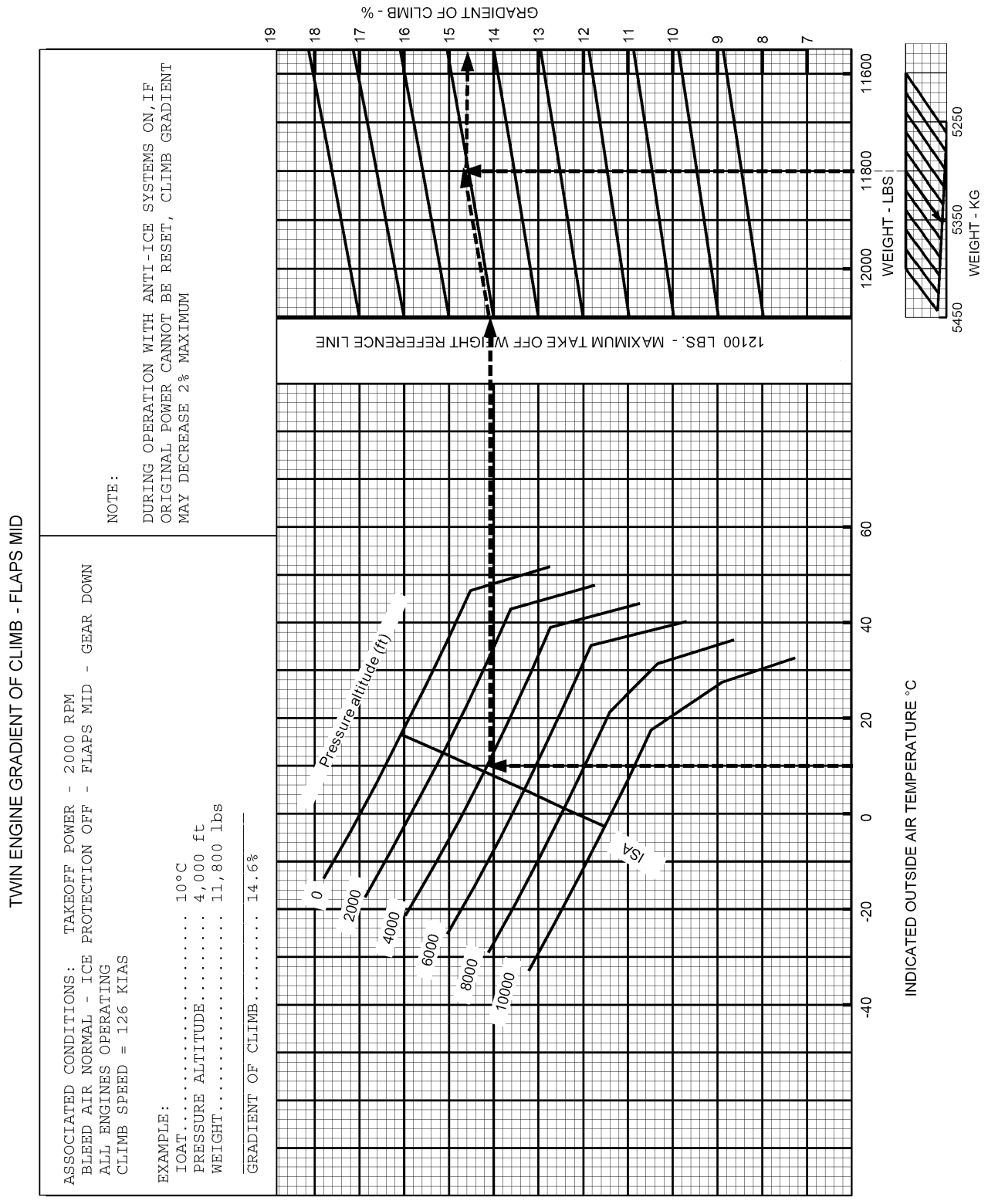
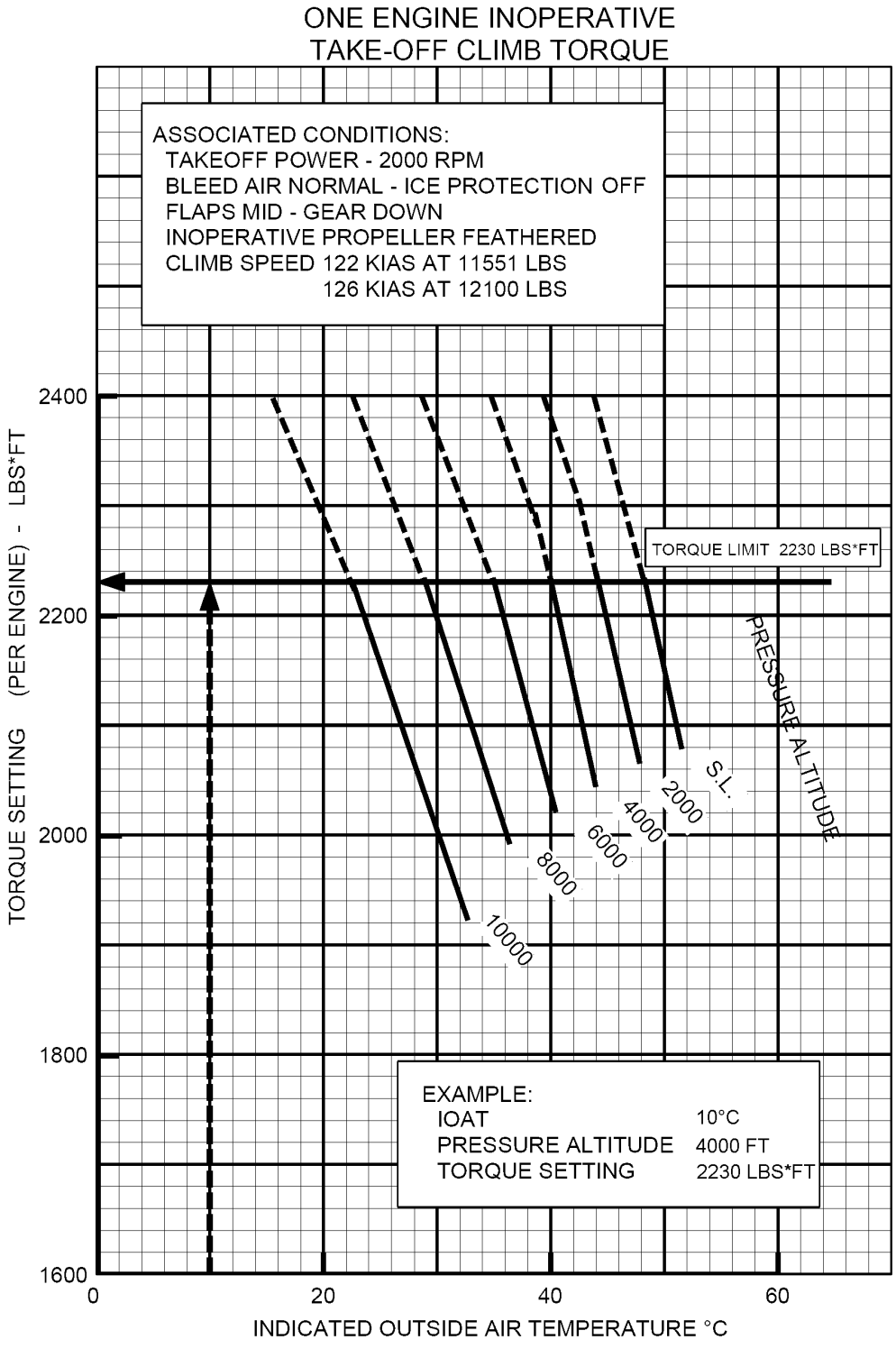


Figure 9-92. TWIN ENGINE GRADIENT OF CLIMB - FLAPS MID



NOTE

This graph is also applicable for CAT II - One Engine Inoperative Go-Around, flown at 125 KIAS, for any weight from 10945 lbs (4965 kg) to 11500 lbs (5216 kg).

Figure 9-93. ONE ENGINE INOPERATIVE TAKEOFF CLIMB TORQUE

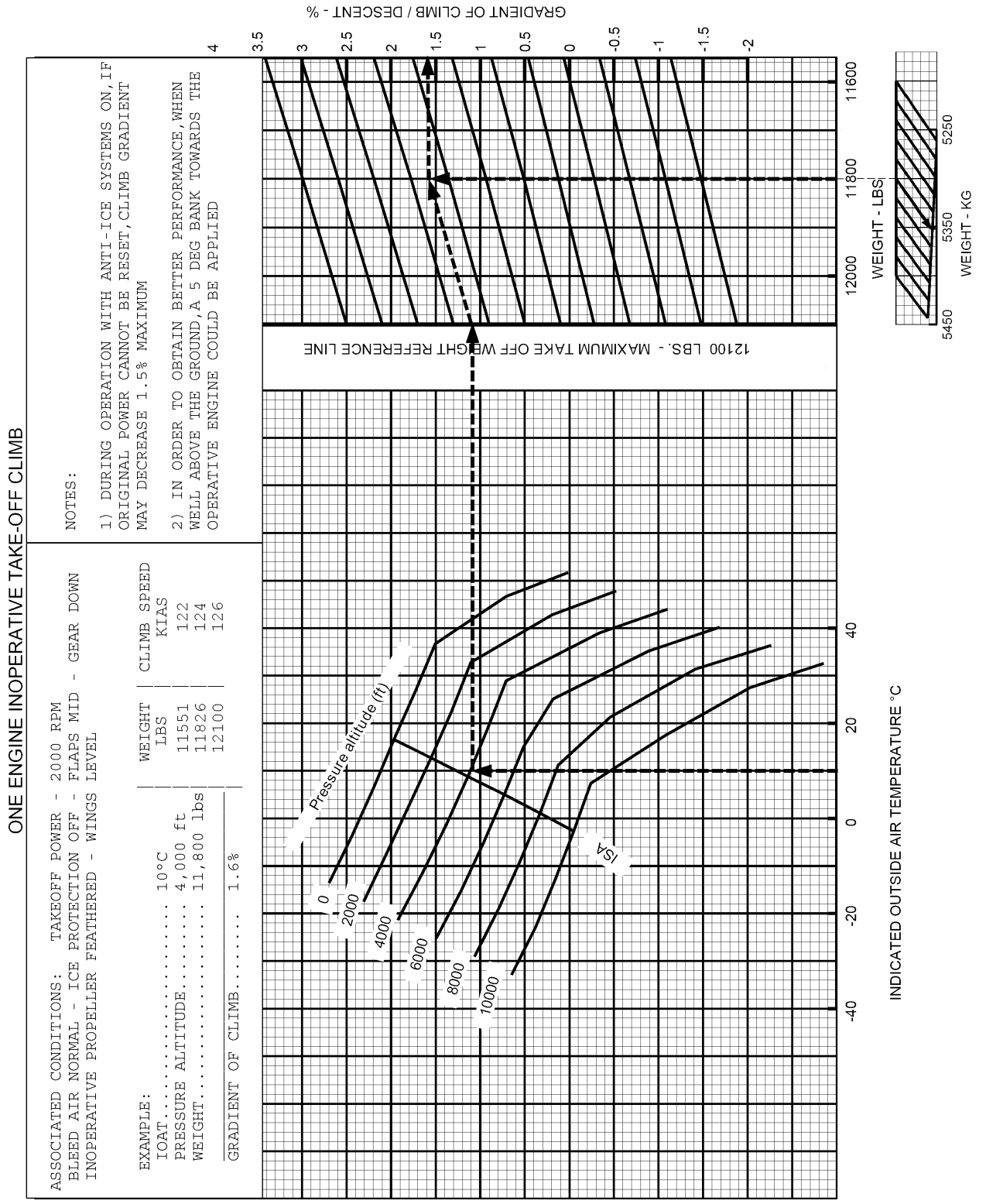


Figure 9-94. ONE ENGINE INOPERATIVE TAKEOFF CLIMB

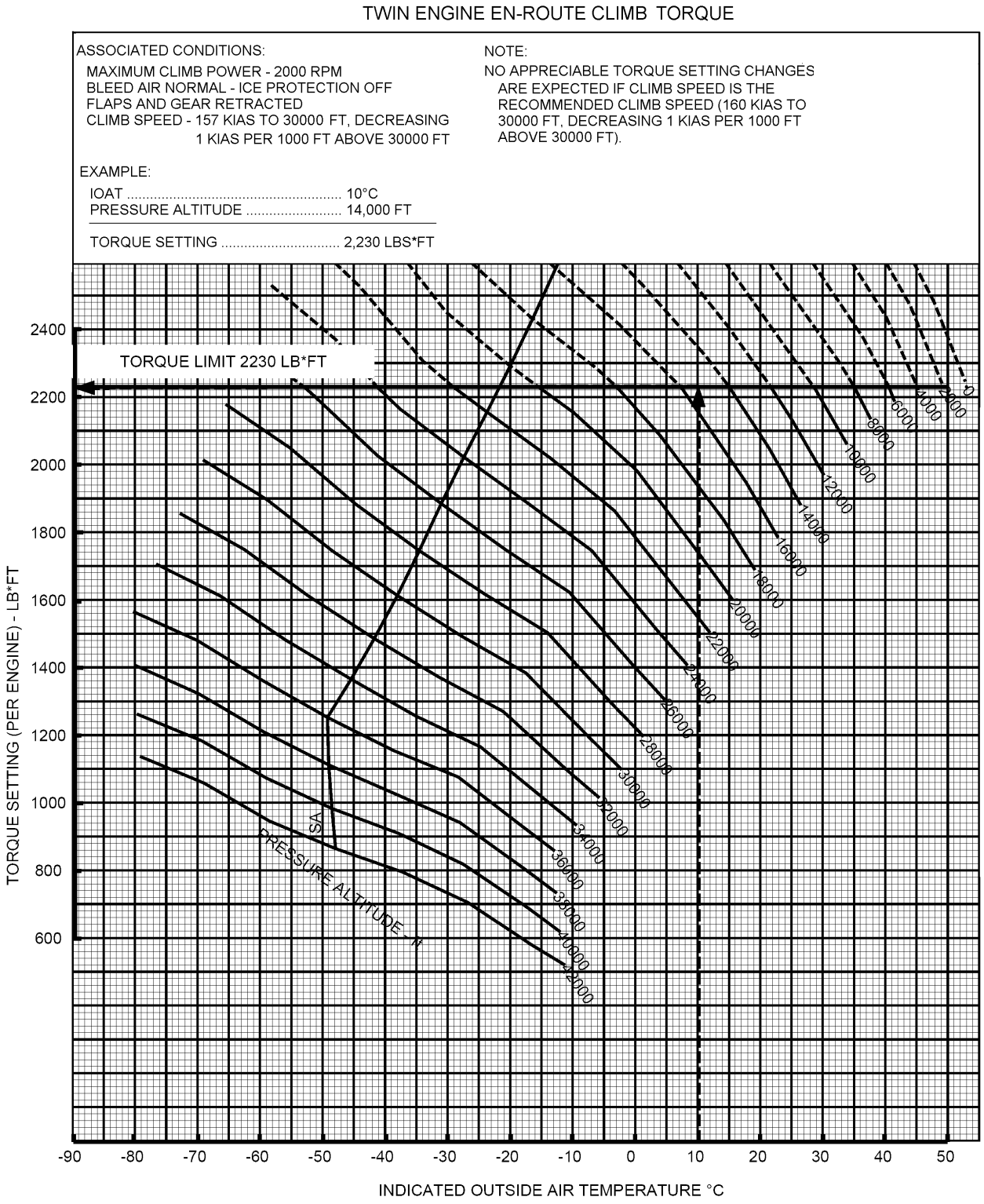


Figure 9-95. TWIN ENGINE EN-ROUTE CLIMB TORQUE
(Equivalent to Fig. 5-27 of the basic AFM/POH)

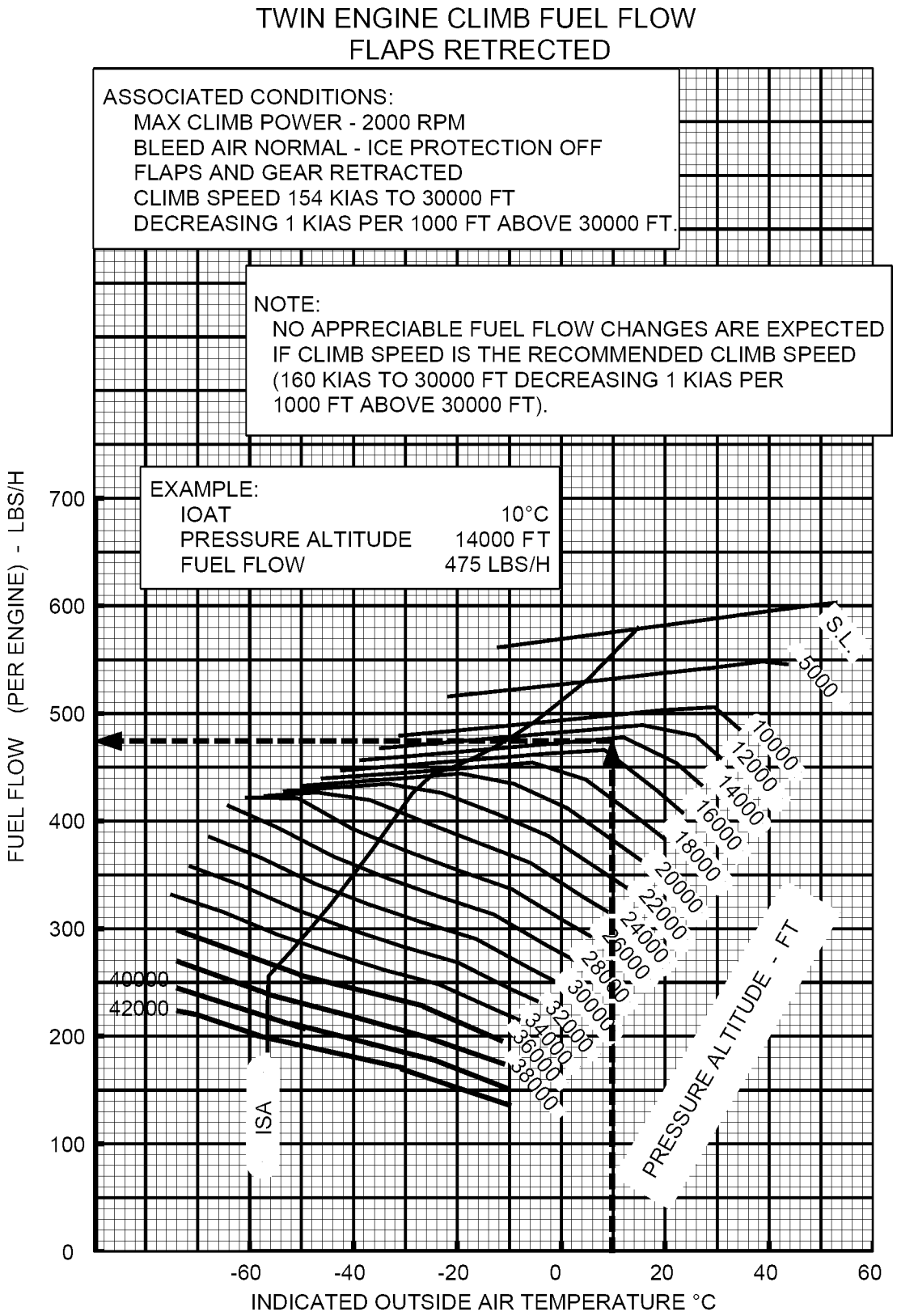


Figure 9-96. TWIN ENGINE CLIMB FUEL FLOW - FLAPS RETRACTED (Equivalent to Fig. 5-28 of the basic AFM/POH)

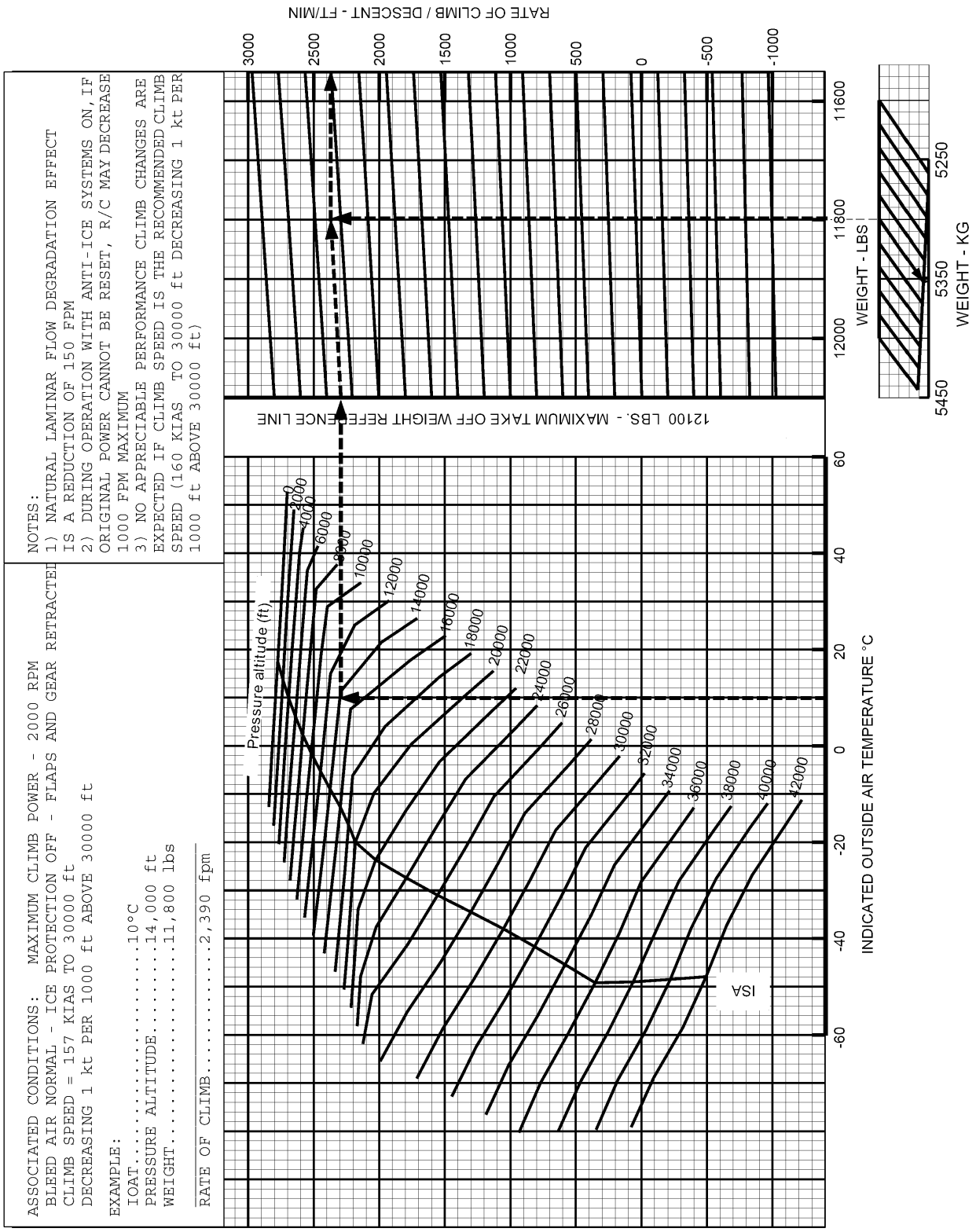


Figure 9-97. TWIN ENGINE EN-ROUTE RATE OF CLIMB/DESCENT
(For lower weights refer to Fig. 5-29 of the basic AFM/POH)

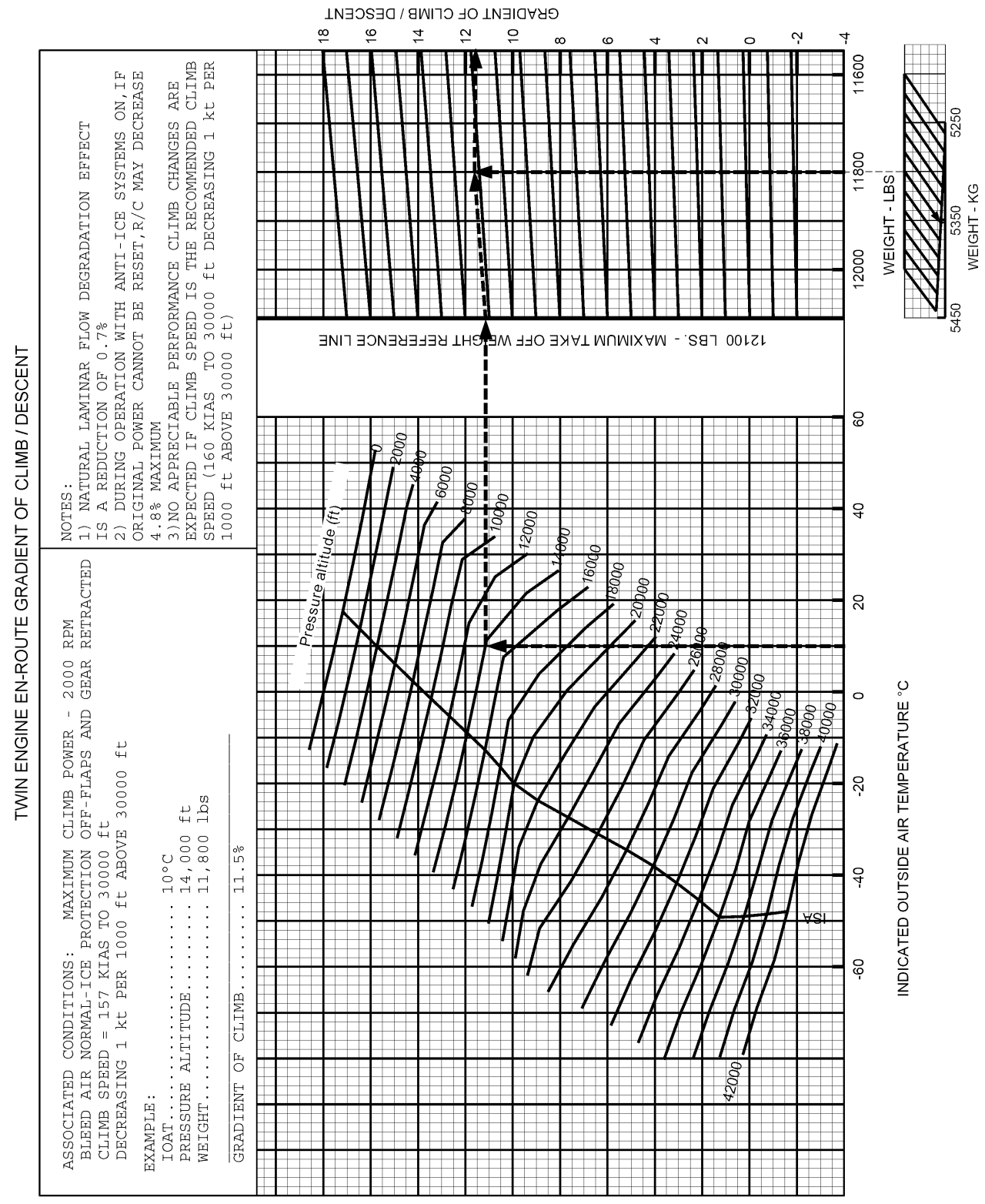

TWIN ENGINE EN-ROUTE GRADIENT OF CLIMB / DESCENT
ASSOCIATED CONDITIONS: MAXIMUM CLIMB POWER - 2000 RPM
BLEED AIR NORMAL-ICE PROTECTION OFF-FLAPS AND GEAR RETRACTED
CLIMB SPEED = 157 KIAS TO 30000 ft
DECREASING 1 kt PER 1000 ft ABOVE 30000 ft
EXAMPLE:
IOAT..... 10°C
PRESSURE ALTITUDE..... 14,000 ft
WEIGHT..... 11,800 lbs
GRADIENT OF CLIMB..... 11.5%
NOTES:
1) NATURAL LAMINAR FLOW DEGRADATION EFFECT IS A REDUCTION OF 0.7%
2) DURING OPERATION WITH ANTI-ICE SYSTEMS ON, IF ORIGINAL POWER CANNOT BE RESET, R/C MAY DECREASE 4.8% MAXIMUM
3) NO APPRECIABLE PERFORMANCE CLIMB CHANGES ARE EXPECTED IF CLIMB SPEED IS THE RECOMMENDED CLIMB SPEED (160 KIAS TO 30000 ft DECREASING 1 kt PER 1000 ft ABOVE 30000 ft)
GRADIENT OF CLIMB / DESCENT
18 16 14 12 10 8 6 4 2 0 -2 -4
12100 LBS. - MAXIMUM TAKE OFF WEIGHT REFERENCE LINE
Pressure altitude (ft)
0 2000 4000 6000 8000 10000 12000 14000 16000 18000 20000 22000 24000 26000 28000 30000 32000 34000 36000 38000 40000 42000
15 0
INDICATED OUTSIDE AIR TEMPERATURE °C
60 40 20 0 -20 -40 -60
WEIGHT - LBS
11600 11800 12000
WEIGHT - KG
5250 5350 5450

Figure 9-98. TWIN ENGINE EN-ROUTE GRADIENT OF CLIMB/DESCENT

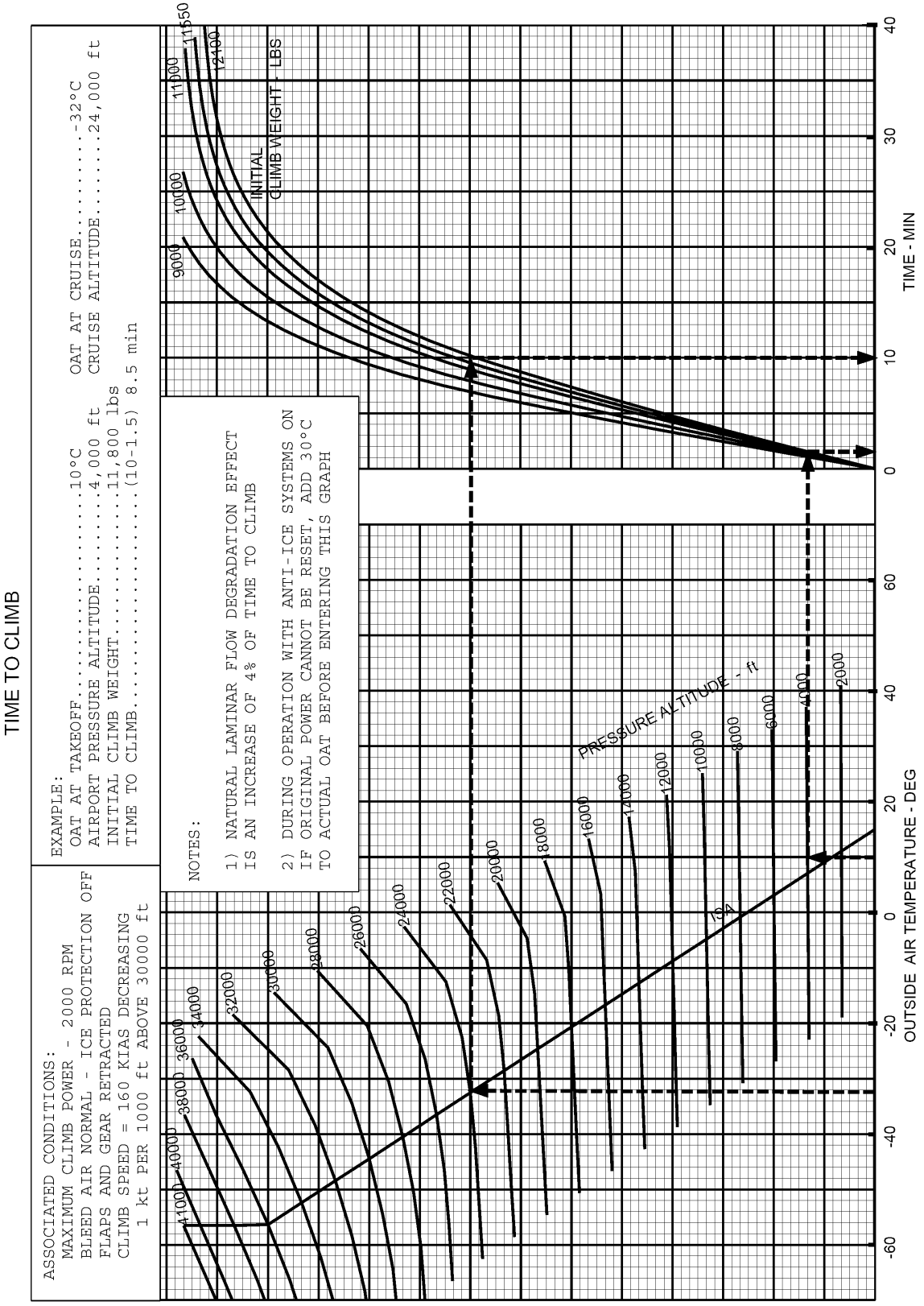


Figure 9-99. TIME TO CLIMB
(This graph supersedes Fig. 5-30 of the basic AFM/POH)

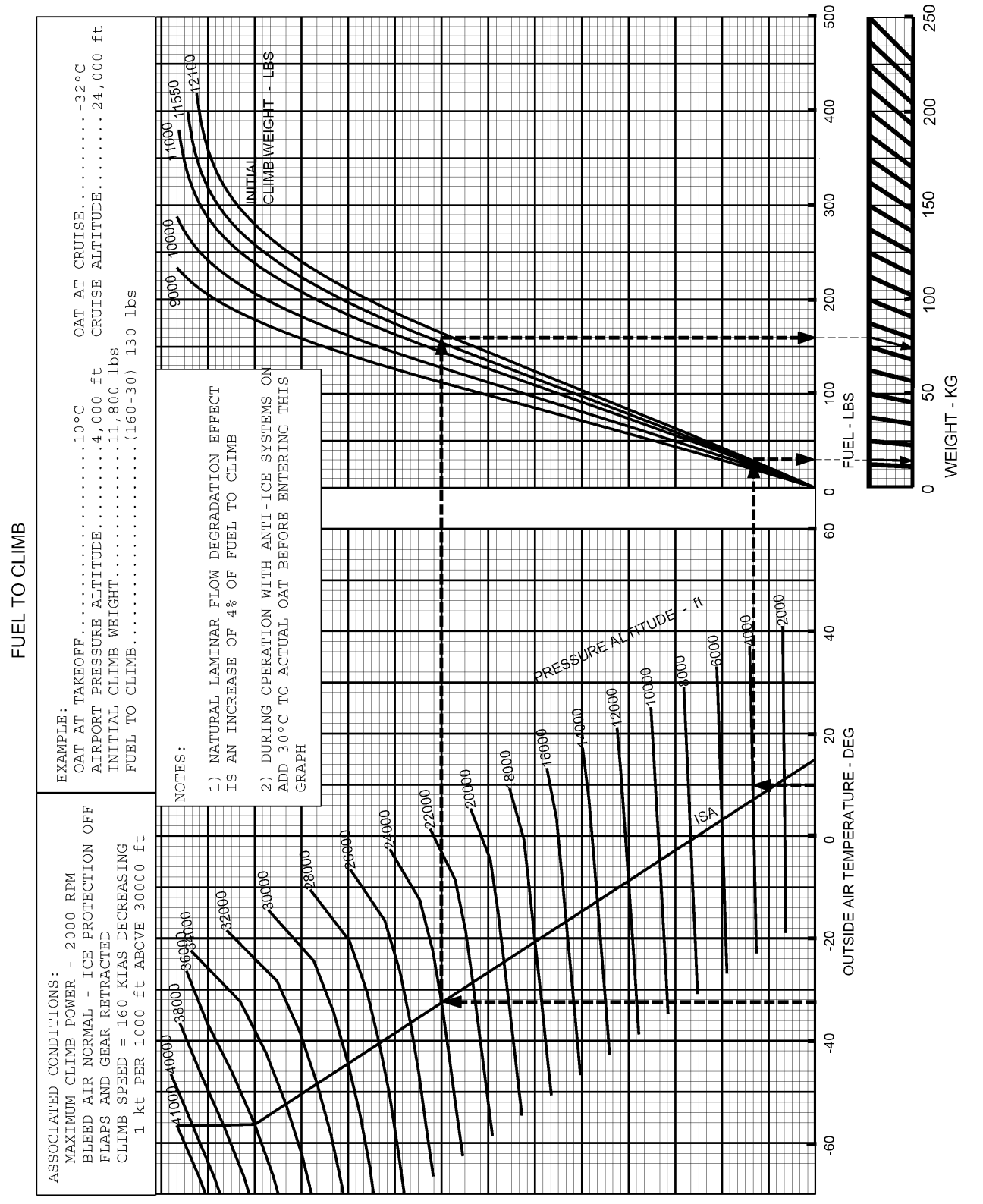


Figure 9-100. FUEL TO CLIMB
(This graph supersedes Fig. 5-31 of the basic AFM/POH)

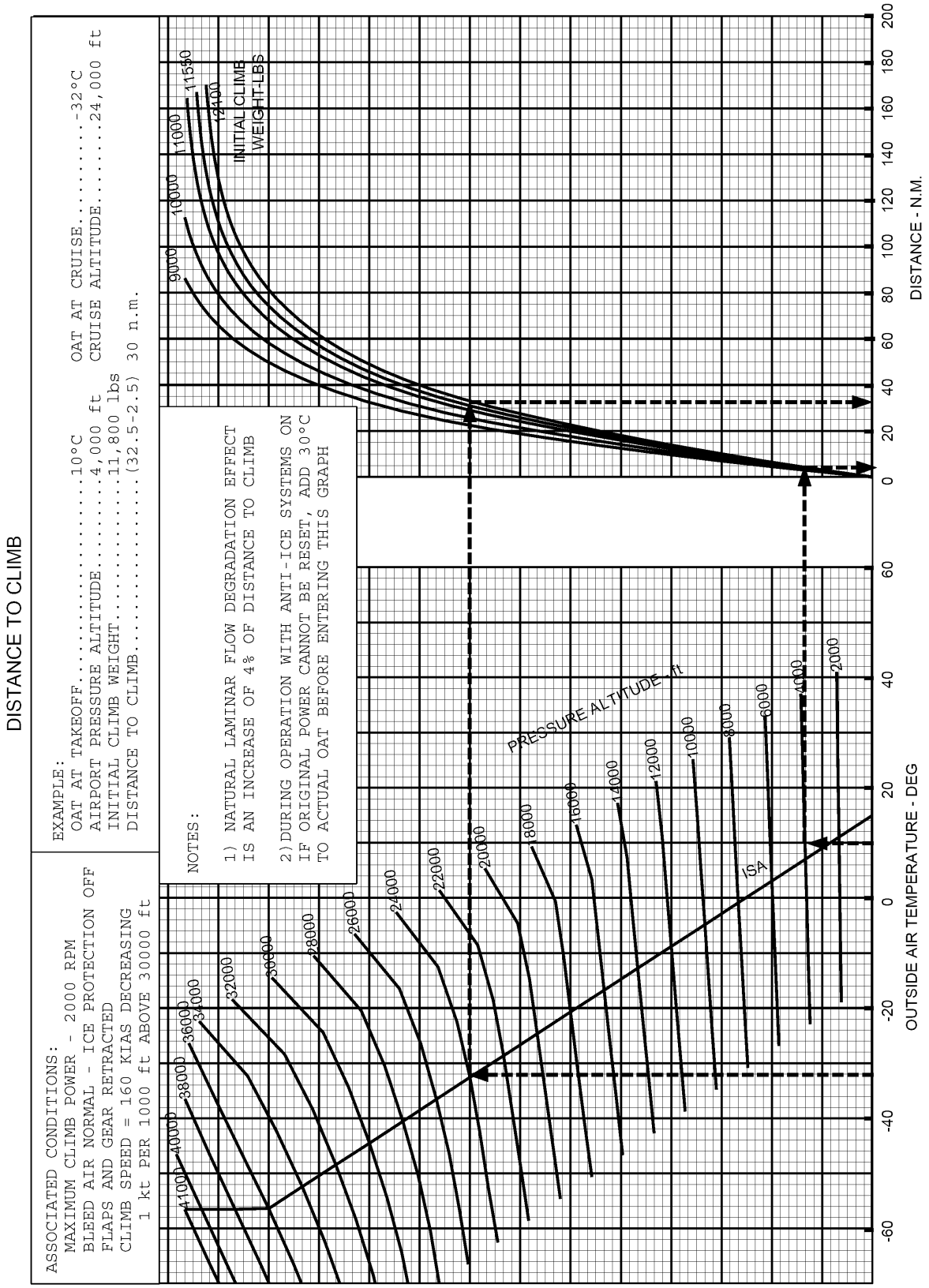


Figure 9-101. DISTANCE TO CLIMB
(This graph supersedes Fig. 5-32 of the basic AFM/POH)

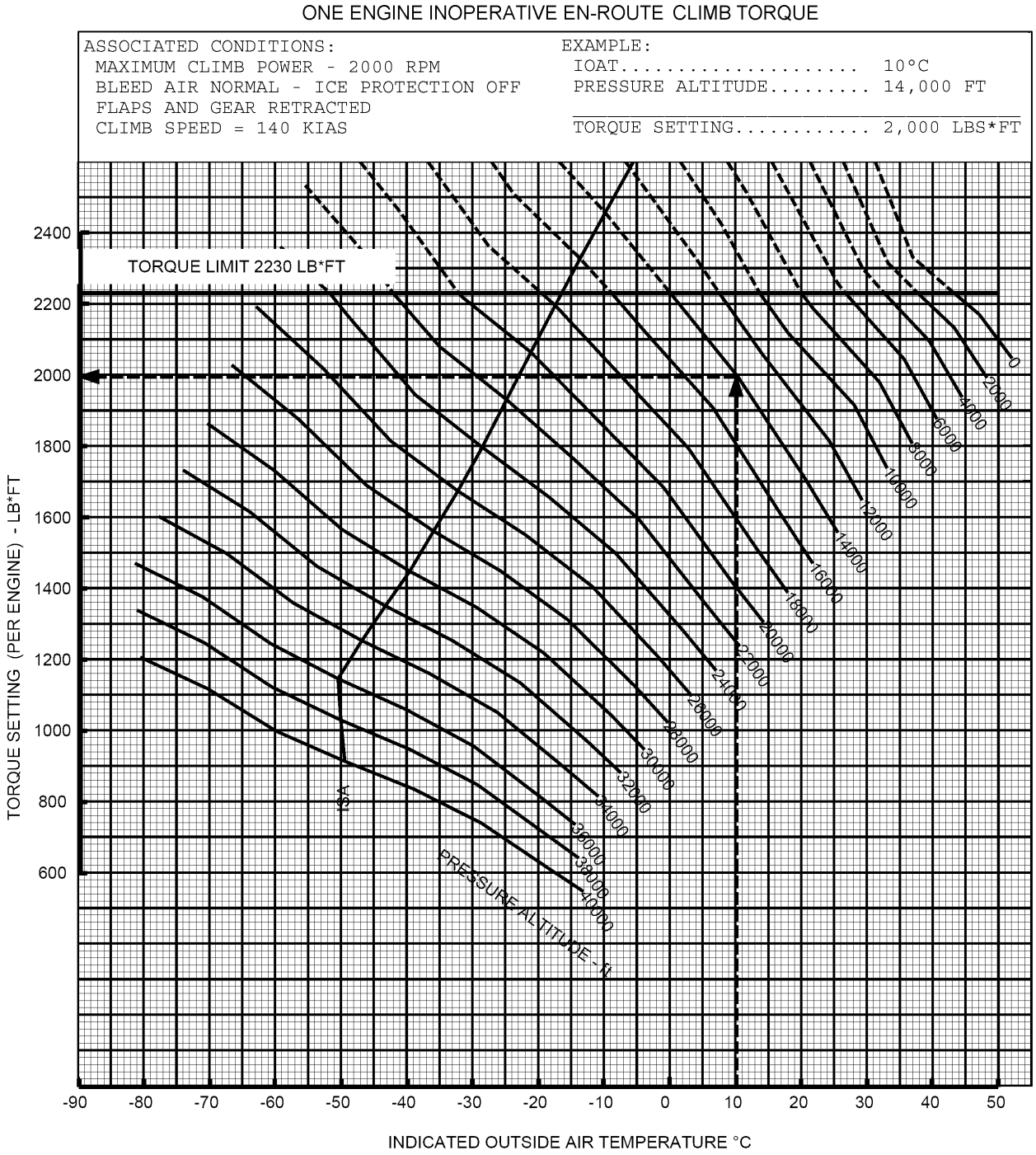


Figure 9-102. ONE ENGINE INOPERATIVE EN-ROUTE CLIMB/DESCENT TORQUE (Equivalent to Fig. 5-33 of the basic AFM/POH)

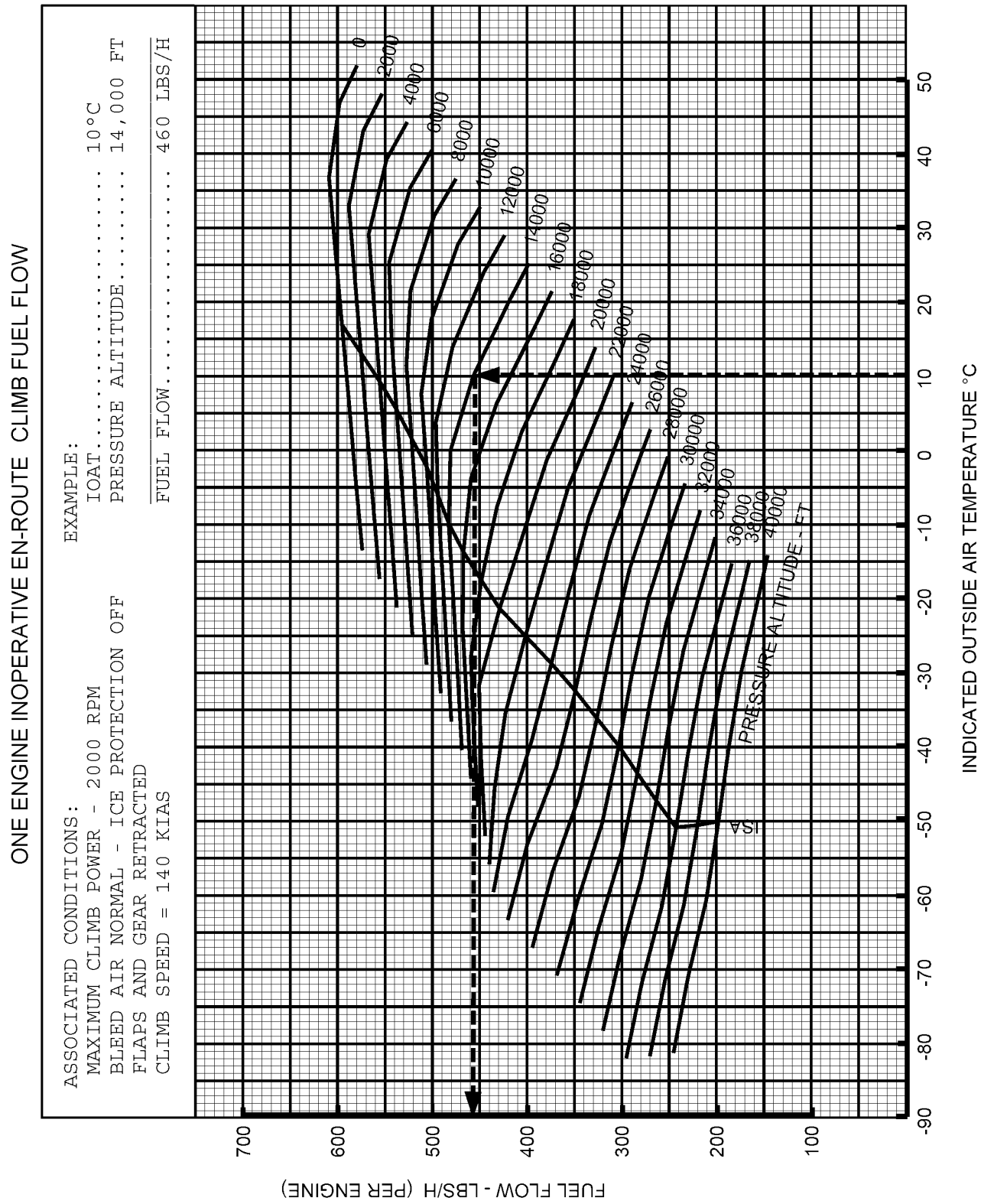


Figure 9-103. ONE ENGINE INOPERATIVE EN-ROUTE CLIMB FUEL FLOW
(Equivalent to Fig. 5-34 of the basic AFM/POH)

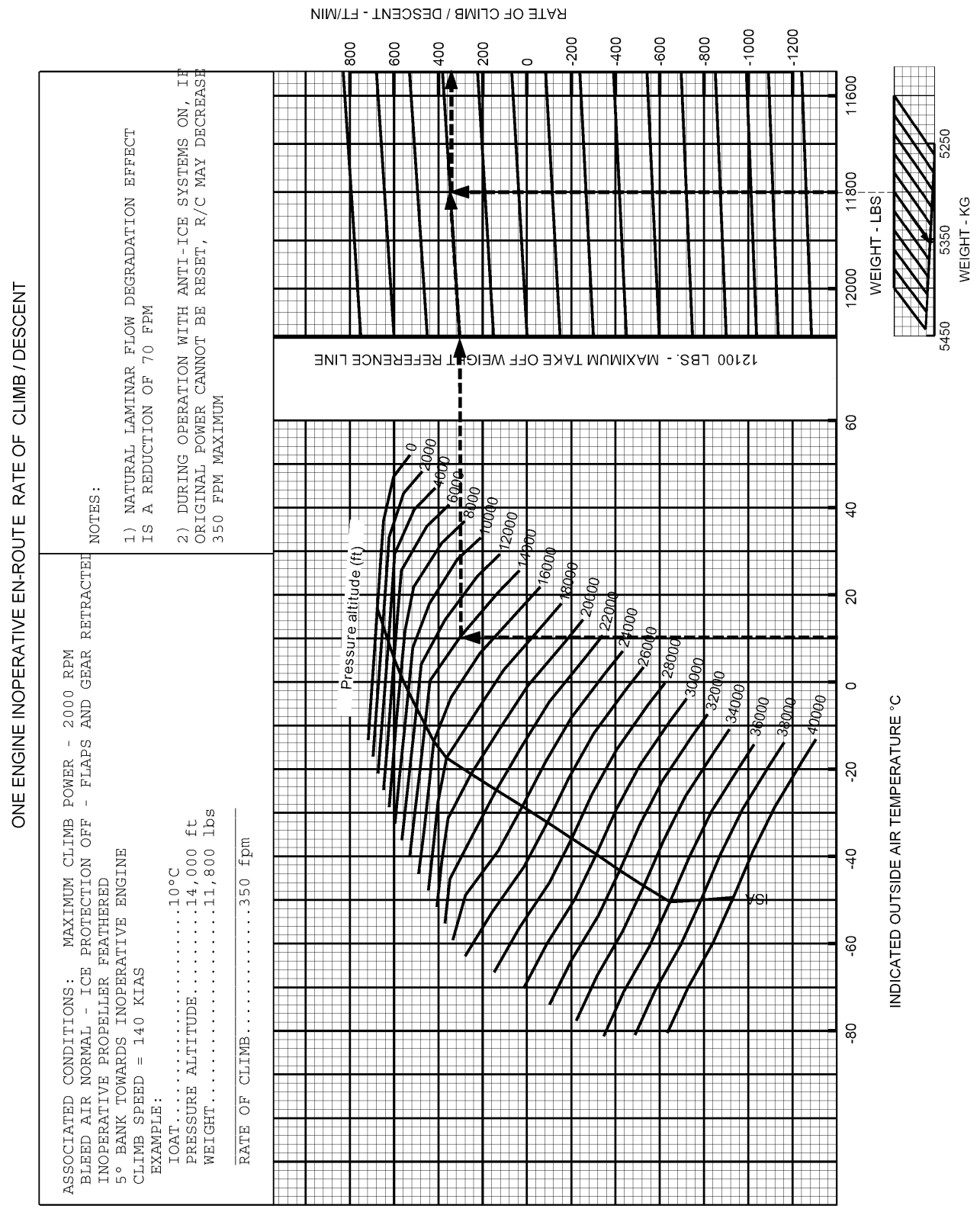


Figure 9-104. ONE ENGINE INOPERATIVE EN-ROUTE RATE OF CLIMB/DESCENT
(For lower weights refer to Fig. 5-35 of the basic AFM/POH)

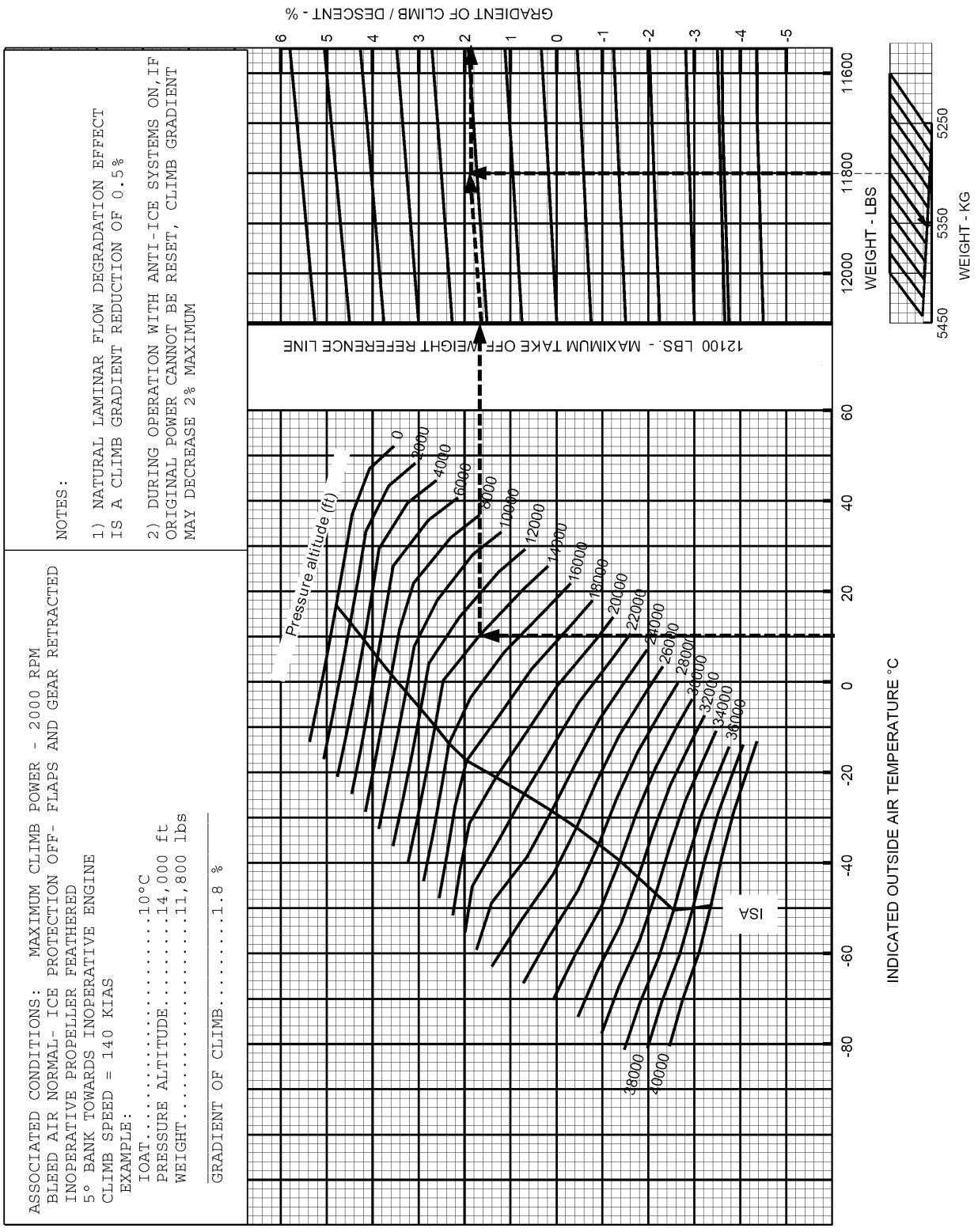

ONE ENGINE INOPERATIVE EN-ROUTE GRADIENT OF CLIMB / DESCENT
ASSOCIATED CONDITIONS: MAXIMUM CLIMB POWER - 2000 RPM
BLEED AIR NORMAL- ICE PROTECTION OFF- FLAPS AND GEAR RETRACTED
INOPERATIVE PROPELLER FEATHERED
5° BANK TOWARDS INOPERATIVE ENGINE
CLIMB SPEED = 140 KIAS
EXAMPLE:
IOAT.....10°C
PRESSURE ALTITUDE.....14,000 ft
WEIGHT.....11,800 lbs
GRADIENT OF CLIMB.....1.8 %
NOTES:
1) NATURAL LAMINAR FLOW DEGRADATION EFFECT IS A CLIMB GRADIENT REDUCTION OF 0.5%
2) DURING OPERATION WITH ANTI-ICE SYSTEMS ON, IF ORIGINAL POWER CANNOT BE RESET, CLIMB GRADIENT MAY DECREASE 2% MAXIMUM
GRADIENT OF CLIMB / DESCENT - %
6 5 4 3 2 1 0 -1 -2 -3 -4 -5
12100 LBS. - MAXIMUM TAKE OFF WEIGHT REFERENCE LINE
Pressure altitude (ft)
0 2000 4000 6000 8000 10000 12000 14000 16000 18000 20000 22000 24000 26000 28000 30000 32000 34000 36000 38000 40000
ISA
INDICATED OUTSIDE AIR TEMPERATURE °C
60 40 20 0 -20 -40 -60 -80
WEIGHT - LBS
11600 11800 12000
WEIGHT - KG
5250 5350 5450

Figure 9-105. ONE ENGINE INOPERATIVE EN-ROUTE GRADIENT OF CLIMB/DESCENT

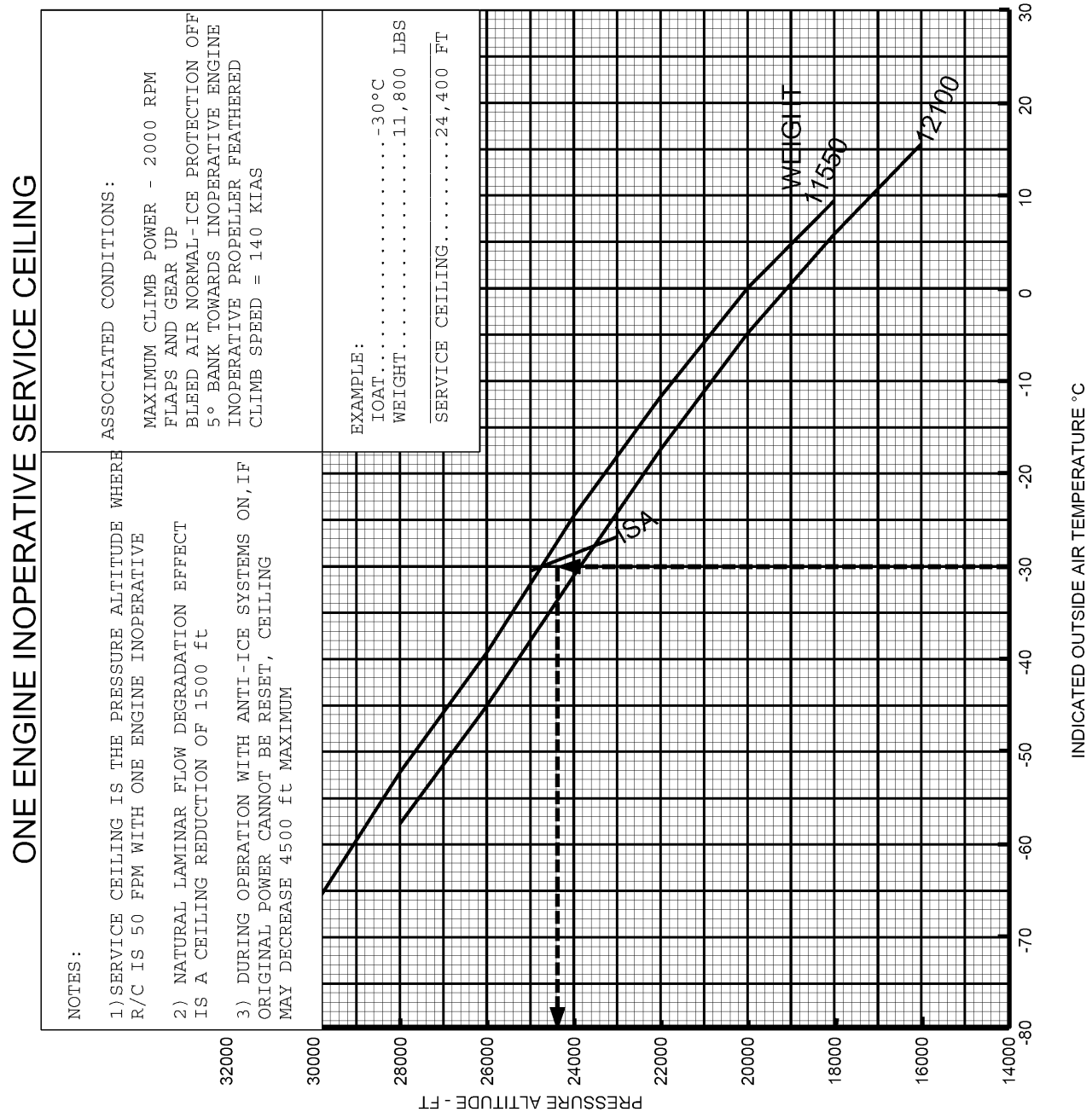


Figure 9-106. ONE ENGINE INOPERATIVE SERVICE CEILING - FLAPS RETRACTED
(For lower weights refer to Fig. 5-36 of the basic AFM/POH)

MAXIMUM CRUISE POWER
2000 RPM
ISA -30°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS		10500 LBS		9500 LBS	
						(5216 KG)		(4763 KG)		(4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	-9	15	1464	450	900	244	260	244	260	244	260
5000	-18	-1	1569	419	838	262	260	262	260	262	260
10000	-27	-17	1672	394	788	281	260	281	260	281	260
15000	-36	-33	1768	375	750	302	260	302	260	302	260
20000	-45	-48	1855	363	726	325	260	325	260	325	260
23000	-50	-57	1932	363	726	340	260	340	260	340	260
25000	-53	-63	1990	364	728	350	260	350	260	350	260
27000	-56	-69	2057	371	742	361	260	361	260	361	260
28000	-58	-72	2097	376	752	366	260	366	260	366	260
29000	-59	-75	2144	383	766	372	260	372	260	372	260
31000	-63	-81	2169	387	774	379	256	379	256	379	256
33000	-67	-88	2015	363	726	375	245	375	245	375	245
35000	-71	-96	1872	341	682	372	234	372	234	372	234
37000	-73	-100	1749	322	644	369	223	369	223	369	223
39000	-73	-100	1644	307	614	369	213	369	213	369	213
41000	-74	-102	1421	271	542	358	196	364	200	369	203

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-107. MAXIMUM CRUISE POWER - 2000 RPM - ISA -30°C (ref. Fig. 5-37)

MAXIMUM CRUISE POWER
2000 RPM
ISA -20°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS		10500 LBS		9500 LBS	
						(5216 KG)		(4763 KG)		(4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	1	34	1492	456	912	249	260	249	260	249	260
5000	-8	17	1601	426	852	267	260	267	260	267	260
10000	-17	2	1707	402	804	286	260	286	260	286	260
15000	-26	-14	1807	384	768	308	260	308	260	308	260
20000	-34	-29	1897	371	742	332	260	332	260	332	260
23000	-39	-38	1977	373	746	348	260	348	260	348	260
25000	-42	-44	2037	375	750	358	260	358	260	358	260
27000	-45	-50	2107	382	764	370	260	370	260	370	260
28000	-47	-53	2148	388	776	375	260	375	260	375	260
29000	-49	-55	2197	395	790	381	260	381	260	381	260
31000	-52	-61	2224	399	798	389	256	389	256	389	256
33000	-56	-69	2066	374	748	385	245	385	245	385	245
35000	-60	-77	1921	352	704	381	234	381	234	381	234
37000	-63	-82	1710	318	636	373	219	378	222	379	223
39000	-64	-83	1471	280	560	361	202	367	205	372	209
41000	-65	-85	1263	246	492	348	185	354	189	360	192

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-108. MAXIMUM CRUISE POWER - 2000 RPM - ISA -20°C (ref. Fig. 5-38)

MAXIMUM CRUISE POWER
2000 RPM
ISA -10°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS (5216 KG)		10500 LBS (4763 KG)		9500 LBS (4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	11	52	1520	462	924	253	260	253	260	253	260
5000	2	36	1631	434	868	272	260	272	260	272	260
10000	-7	20	1741	411	822	292	260	292	260	292	260
15000	-15	5	1844	393	786	315	260	315	260	315	260
20000	-24	-10	1938	382	764	339	260	339	260	339	260
23000	-28	-19	2021	383	766	355	260	355	260	355	260
25000	-32	-25	2083	386	772	366	260	366	260	366	260
27000	-35	-31	2156	394	788	378	260	378	260	378	260
28000	-36	-33	2198	400	800	384	260	384	260	384	260
29000	-38	-36	2221	403	806	389	258	390	260	390	260
31000	-42	-44	2032	372	744	383	246	387	249	391	251
33000	-47	-52	1855	344	688	377	233	382	236	386	239
35000	-51	-60	1687	316	632	370	221	375	224	380	227
37000	-54	-65	1491	285	570	361	206	366	209	371	212
39000	-55	-67	1267	249	498	346	188	352	191	358	195
41000	-56	-69	1080	218	436	-	-	337	174	345	178

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-109. MAXIMUM CRUISE POWER - 2000 RPM - ISA -10°C (ref. Fig. 5-39)

MAXIMUM CRUISE POWER
2000 RPM
ISA

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS		10500 LBS		9500 LBS	
						(5216 KG)		(4763 KG)		(4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	21	70	1547	470	940	258	260	258	260	258	260
5000	12	54	1661	444	888	277	260	277	260	277	260
10000	4	39	1774	421	842	298	260	298	260	298	260
15000	-5	23	1881	403	806	321	260	321	260	321	260
20000	-13	8	1978	392	784	346	260	346	260	346	260
23000	-18	0	2064	394	788	363	260	363	260	363	260
25000	-21	-6	2128	396	792	374	260	374	260	374	260
27000	-24	-12	2203	404	808	386	260	386	260	386	260
28000	-26	-15	2108	389	778	384	254	387	256	390	258
29000	-29	-19	2014	374	748	381	247	385	250	388	252
31000	-33	-27	1838	345	690	375	235	380	238	384	240
33000	-37	-35	1666	317	634	368	222	373	225	378	228
35000	-42	-43	1504	291	582	360	209	366	212	371	216
37000	-45	-49	1316	260	520	348	193	354	197	360	200
39000	-46	-51	1122	228	456	331	175	339	179	347	184
41000	-48	-54	938	198	396	-	-	-	-	330	166

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-110. MAXIMUM CRUISE POWER - 2000 RPM - ISA (ref. Fig. 5-40)

PIAGGIO AERO

MAXIMUM CRUISE POWER
2000 RPM
ISA +10°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS		10500 LBS		9500 LBS	
						(5216 KG)		(4763 KG)		(4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	32	89	1573	480	960	262	260	262	260	262	260
5000	23	73	1691	454	908	282	260	282	260	282	260
10000	14	57	1807	432	864	303	260	303	260	303	260
15000	6	42	1917	414	828	327	260	327	260	327	260
20000	-3	27	2018	402	804	353	260	353	260	353	260
23000	-7	19	2106	403	806	370	260	370	260	370	260
25000	-11	13	2172	406	812	382	260	382	260	382	260
27000	-15	6	2014	379	758	379	249	382	251	385	253
28000	-17	2	1925	364	728	377	243	380	245	383	247
29000	-19	-2	1836	349	698	374	237	378	239	381	241
31000	-24	-10	1666	321	642	367	224	372	227	376	230
33000	-28	-19	1500	294	588	358	210	364	214	369	217
35000	-33	-27	1338	267	534	348	196	354	200	361	204
37000	-36	-32	1172	239	478	334	180	342	185	350	189
39000	-37	-35	992	209	418	-	-	323	166	334	172
41000	-	-	-	-	-	-	-	-	-	-	-

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-111. MAXIMUM CRUISE POWER - 2000 RPM - ISA +10°C (ref. Fig. 5-41)

MAXIMUM CRUISE POWER
2000 RPM
ISA +20°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS		10500 LBS		9500 LBS	
						(5216 KG)		(4763 KG)		(4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	42	107	1600	492	984	267	260	267	260	267	260
5000	33	91	1720	465	930	287	260	287	260	287	260
10000	24	76	1839	443	886	309	260	309	260	309	260
15000	16	61	1952	425	850	333	260	333	260	333	260
20000	8	46	2056	412	824	360	260	360	260	360	260
23000	3	37	2115	407	814	375	258	377	260	377	260
25000	-1	30	1959	378	756	373	248	375	249	378	251
27000	-5	22	1793	350	700	368	236	371	238	374	240
28000	-8	18	1712	336	672	366	230	369	232	372	234
29000	-10	14	1631	322	644	362	224	366	227	370	229
31000	-14	6	1474	296	592	354	211	360	214	364	217
33000	-19	-2	1318	270	540	343	196	350	201	357	205
35000	-24	-11	1182	246	492	331	182	340	187	347	192
37000	-27	-17	1036	221	442	311	164	325	171	335	177
39000	-27	-17	875	193	386	-	-	-	-	308	155
41000	-	-	-	-	-	-	-	-	-	-	-

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-112. MAXIMUM CRUISE POWER - 2000 RPM - ISA +20°C (ref. Fig. 5-42)

MAXIMUM CRUISE POWER
2000 RPM
ISA +30°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS		10500 LBS		9500 LBS	
						(5216 KG)		(4763 KG)		(4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	52	126	1625	503	1006	271	260	271	260	271	260
5000	43	110	1749	477	954	291	260	291	260	291	260
10000	35	94	1871	454	908	314	260	314	260	314	260
15000	26	79	1987	433	866	339	260	339	260	339	260
20000	18	64	1971	402	804	358	253	360	254	361	255
23000	12	53	1780	363	726	356	239	359	241	361	243
25000	7	45	1645	337	674	352	229	356	231	359	233
27000	3	37	1496	310	620	347	217	350	220	354	222
28000	1	33	1422	298	596	343	211	347	214	351	216
29000	-2	29	1346	284	568	337	204	344	208	348	210
31000	-6	21	1197	259	518	323	188	333	194	340	198
33000	-11	12	1073	236	472	307	171	321	180	332	186
35000	-15	4	974	217	434	-	-	305	164	320	172
37000	-18	-1	847	194	388	-	-	-	-	294	151
39000	-	-	-	-	-	-	-	-	-	-	-
41000	-	-	-	-	-	-	-	-	-	-	-

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-113. MAXIMUM CRUISE POWER - 2000 RPM - ISA +30°C (ref. Fig. 5-43)

RECOMMENDED CRUISE POWER
1800 RPM
ISA -30°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS (5216 KG)		10500 LBS (4763 KG)		9500 LBS (4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	-9	15	1641	446	892	244	260	244	260	244	260
5000	-18	-1	1768	417	834	262	260	262	260	262	260
10000	-27	-17	1871	391	782	281	260	281	260	281	260
15000	-36	-33	1964	372	744	302	260	302	260	302	260
20000	-45	-48	2058	360	720	325	260	325	260	325	260
23000	-50	-57	2149	362	724	340	260	340	260	340	260
25000	-53	-63	2222	366	732	350	260	350	260	350	260
27000	-56	-69	2230	364	728	356	256	360	259	361	260
28000	-58	-73	2230	364	728	359	254	362	257	366	259
29000	-60	-76	2230	363	726	363	253	365	255	369	257
31000	-63	-82	2230	363	726	370	250	372	251	375	253
33000	-67	-88	2164	354	708	375	245	375	245	375	245
35000	-71	-96	1969	326	652	372	234	372	234	372	234
37000	-73	-100	1799	301	602	369	223	369	223	369	223
39000	-73	-100	1654	281	562	369	213	369	213	369	213
41000	-74	-100	1505	260	520	367	202	369	203	369	203

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-114. RECOMMENDED CRUISE POWER - 1800 RPM - ISA -30°C (ref. Fig. 5-44)

RECOMMENDED CRUISE POWER
1800 RPM
ISA -20°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS (5216 KG)		10500 LBS (4763 KG)		9500 LBS (4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	1	34	1672	451	902	249	260	249	260	249	260
5000	-8	17	1804	424	848	267	260	267	260	267	260
10000	-17	2	1910	400	800	286	260	286	260	286	260
15000	-26	-14	2007	380	760	308	260	308	260	308	260
20000	-34	-29	2105	369	738	332	260	332	260	332	260
23000	-39	-38	2199	372	744	348	260	348	260	348	260
25000	-42	-44	2230	371	742	356	258	358	260	358	260
27000	-46	-51	2230	368	736	362	254	365	256	368	259
28000	-48	-54	2230	368	736	365	252	368	254	372	257
29000	-49	-57	2230	367	734	368	250	371	252	375	255
31000	-53	-63	2230	367	734	376	247	378	249	381	251
33000	-56	-69	2199	363	726	384	244	385	245	385	245
35000	-60	-77	2010	335	670	380	233	381	234	381	234
37000	-63	-82	1794	303	606	374	220	377	222	379	223
39000	-64	-84	1537	266	532	358	200	364	204	369	207
41000	-66	-86	1308	233	466	336	178	347	185	355	189

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-115. RECOMMENDED CRUISE POWER - 1800 RPM - ISA -20°C (ref. Fig. 5-45)

RECOMMENDED CRUISE POWER
1800 RPM
ISA -10°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS		10500 LBS		9500 LBS	
						(5216 KG)		(4763 KG)		(4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	11	52	1703	456	912	253	260	253	260	253	260
5000	2	36	1838	432	864	272	260	272	260	272	260
10000	-7	20	1948	409	818	292	260	292	260	292	260
15000	-15	5	2049	390	780	315	260	315	260	315	260
20000	-24	-10	2150	380	760	339	260	339	260	339	260
23000	-29	-19	2230	381	762	354	259	355	260	355	260
25000	-32	-26	2230	375	750	361	255	364	258	366	260
27000	-36	-32	2230	373	746	367	252	371	254	374	256
28000	-37	-35	2230	372	744	371	250	374	252	377	255
29000	-39	-38	2230	371	742	374	248	377	250	381	253
31000	-43	-45	2112	354	708	374	240	377	242	381	244
33000	-47	-53	1930	327	654	369	228	373	231	376	233
35000	-52	-61	1755	301	602	363	216	368	219	372	221
37000	-55	-66	1546	270	540	351	200	358	204	363	207
39000	-56	-69	1312	236	472	328	177	340	184	349	189
41000	-58	-72	1111	206	412	-	-	316	163	331	171

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-116. RECOMMENDED CRUISE POWER - 1800 RPM - ISA -10°C (ref. Fig. 5-46)

RECOMMENDED CRUISE POWER
1800 RPM
ISA

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS (5216 KG)		10500 LBS (4763 KG)		9500 LBS (4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	21	70	1734	465	930	258	260	258	260	258	260
5000	12	54	1872	442	884	277	260	277	260	277	260
10000	4	39	1986	418	836	298	260	298	260	298	260
15000	-5	23	2089	400	800	321	260	321	260	321	260
20000	-13	8	2195	391	782	346	260	346	260	346	260
23000	-18	-1	2230	386	772	359	257	362	259	363	260
25000	-22	-7	2230	380	760	366	253	369	255	372	258
27000	-25	-13	2230	377	754	373	250	376	252	379	254
28000	-27	-17	2191	371	742	374	246	377	249	381	252
29000	-29	-21	2096	356	712	371	240	375	243	379	246
31000	-34	-29	1910	329	658	365	228	369	231	374	234
33000	-38	-37	1731	302	604	357	215	363	218	368	221
35000	-43	-45	1559	276	552	347	201	355	205	361	209
37000	-46	-51	1362	247	494	330	183	341	189	350	194
39000	-48	-54	1157	216	432	303	159	319	168	332	175
41000	-50	-58	961	187	374	-	-	-	-	307	154

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-117. RECOMMENDED CRUISE POWER - 1800 RPM - ISA (ref. Fig. 5-47)

RECOMMENDED CRUISE POWER
1800 RPM
ISA +10°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS		10500 LBS		9500 LBS	
						(5216 KG)		(4763 KG)		(4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	32	89	1763	475	950	262	260	262	260	262	260
5000	23	73	1906	453	906	282	260	282	260	282	260
10000	14	57	2022	430	860	303	260	303	260	303	260
15000	6	42	2129	412	824	327	260	327	260	327	260
20000	-3	27	2230	400	800	353	259	353	260	353	260
23000	-8	18	2230	390	780	364	255	366	257	368	258
25000	-11	12	2230	384	768	371	251	374	253	377	256
27000	-15	4	2096	362	724	369	242	373	244	377	247
28000	-18	0	2002	348	696	366	236	370	238	374	241
29000	-20	-4	1909	334	668	363	229	368	232	372	235
31000	-24	-12	1728	307	614	354	216	361	220	366	223
33000	-29	-20	1551	280	560	343	201	352	206	359	211
35000	-34	-29	1380	254	508	329	185	340	192	349	197
37000	-37	-35	1209	228	456	309	166	324	175	336	182
39000	-39	-39	1012	198	396	-	-	296	151	314	161
41000	-	-	-	-	-	-	-	-	-	-	-

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-118. RECOMMENDED CRUISE POWER - 1800 RPM - ISA +10°C (ref. Fig. 5-48)

PIAGGIO AERO

RECOMMENDED CRUISE POWER
1800 RPM
ISA +20°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS		10500 LBS		9500 LBS	
						(5216 KG)		(4763 KG)		(4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	42	107	1793	488	976	267	260	267	260	267	260
5000	33	91	1938	465	930	287	260	287	260	287	260
10000	24	76	2058	442	884	309	260	309	260	309	260
15000	16	61	2169	423	846	333	260	333	260	333	260
20000	8	46	2230	405	810	357	257	358	258	360	259
23000	2	36	2218	392	784	367	252	370	254	373	256
25000	-2	29	2052	364	728	364	241	367	244	371	246
27000	-6	21	1878	337	674	359	230	363	232	366	235
28000	-8	17	1793	323	646	356	224	360	226	364	229
29000	-11	13	1708	310	620	351	217	357	221	361	223
31000	-15	4	1539	284	568	341	202	349	208	355	211
33000	-20	-4	1370	258	516	326	186	337	193	346	198
35000	-25	-13	1234	236	472	311	170	324	178	336	185
37000	-29	-20	1077	211	422	285	149	305	160	320	169
39000	-	-	-	-	-	-	-	-	-	-	-
41000	-	-	-	-	-	-	-	-	-	-	-

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-119. RECOMMENDED CRUISE POWER - 1800 RPM - ISA +20°C (ref. Fig. 5-49)

RECOMMENDED CRUISE POWER
1800 RPM
ISA +30°C

PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENG.	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11500 LBS		10500 LBS		9500 LBS	
						(5216 KG)		(4763 KG)		(4309 KG)	
FEET	°C	°F	LB • FT	LBS/HR	LBS/HR	TAS	IAS	TAS	IAS	TAS	IAS
0	52	126	1822	500	1000	271	260	271	260	271	260
5000	43	110	1971	477	954	291	260	291	260	291	260
10000	35	94	2094	453	906	314	260	314	260	314	260
15000	26	79	2207	432	864	339	260	339	260	339	260
20000	17	63	2085	390	780	352	248	353	250	355	251
23000	11	52	1880	352	704	348	234	352	236	354	238
25000	7	44	1735	326	652	344	223	348	226	352	228
27000	2	36	1576	301	602	338	211	342	214	347	217
28000	0	32	1497	288	576	334	205	339	208	343	211
29000	-2	28	1415	275	550	327	197	335	202	340	205
31000	-7	19	1259	250	500	310	179	323	187	332	193
33000	-12	10	1131	229	458	291	162	309	172	322	180
35000	-18	0	1003	207	414	-	-	289	155	308	165
37000	-	-	-	-	-	-	-	-	-	-	-
39000	-	-	-	-	-	-	-	-	-	-	-
41000	-	-	-	-	-	-	-	-	-	-	-

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on, torque may decrease 20%, true airspeed 30 knots and fuel flow 10%, approximately.
If original power is reset, fuel flow may increase approximately 30LB/H/ENGINE, and speed remains unchanged.

Figure 9-120. RECOMMENDED CRUISE POWER - 1800 RPM - ISA +30°C (ref. Fig. 5-50)

MAXIMUM RANGE POWER
2000 RPM
ISA -30°C

PRESSURE ALTITUDE	IOAT		11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	-10	15	1380	440	239	254	1323	433	237	252	1264	425	235	250
5000	-19	-3	1292	385	243	241	1257	381	242	240	1198	374	240	238
10000	-29	-21	1227	340	248	229	1145	330	244	225	1085	323	241	223
15000	-39	-38	1162	300	254	218	1099	293	251	215	1014	282	246	210
20000	-49	-55	1063	262	258	204	1002	255	254	201	944	248	251	198
23000	-54	-66	1076	251	266	201	982	239	260	196	914	231	255	193
25000	-58	-73	1063	241	270	198	973	229	263	193	884	218	257	188
27000	-62	-80	1035	230	272	193	964	221	268	189	874	210	260	184
28000	-64	-83	1028	226	274	191	956	217	269	188	884	208	264	184
29000	-66	-86	1030	224	276	189	947	213	271	186	865	202	264	181
31000	-70	-93	1030	218	280	186	931	205	273	181	850	194	268	177
33000	-73	-100	1006	211	281	180	923	199	276	177	840	188	271	173
35000	-77	-107	993	205	285	176	914	194	280	173	836	182	275	170
37000	-79	-110	970	199	287	170	905	189	284	169	828	178	279	165
39000	-79	-110	953	194	291	165	889	184	288	163	815	173	283	160
41000	-79	-109	938	190	296	160	869	179	292	158	802	169	287	155

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 9-121. MAXIMUM RANGE POWER - 2000 RPM - ISA -30°C (ref. Fig. 5-51)

MAXIMUM RANGE POWER
2000 RPM
ISA -20°C

PRESSURE ALTITUDE	IOAT		11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	0	32	1334	436	239	249	1275	428	237	247	1214	420	235	245
5000	-9	15	1272	385	244	237	1217	378	242	235	1156	370	240	233
10000	-19	-2	1215	341	250	226	1147	332	247	223	1085	325	244	221
15000	-29	-20	1167	303	258	216	1102	295	254	213	1035	287	251	210
20000	-38	-37	1087	267	264	204	1029	260	260	202	965	252	256	198
23000	-44	-47	1101	257	272	201	987	242	263	194	921	234	259	191
25000	-48	-54	1088	247	276	198	1000	235	270	193	887	221	261	186
27000	-52	-61	1059	236	279	193	986	227	274	189	895	215	266	184
28000	-54	-64	1053	233	281	191	962	221	273	186	893	211	269	183
29000	-55	-68	1055	230	283	189	954	216	275	184	885	207	271	181
31000	-59	-75	1040	223	285	184	953	211	280	181	856	198	272	176
33000	-63	-82	1031	217	289	180	946	205	283	177	848	191	276	172
35000	-67	-88	1018	212	292	176	937	200	287	173	857	188	282	170
37000	-69	-92	999	206	295	171	925	195	291	168	849	183	286	165
39000	-68	-91	981	201	300	165	915	190	296	163	838	179	291	160
41000	-68	-91	958	196	303	160	893	185	300	158	826	175	296	155

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 9-122. MAXIMUM RANGE POWER - 2000 RPM - ISA -20°C (ref. Fig. 5-52)

MAXIMUM RANGE POWER
2000 RPM
ISA -10°C

			11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	10	50	1250	424	235	241	1187	416	233	239	1123	407	231	236
5000	1	33	1234	382	244	233	1194	377	243	232	1132	368	241	229
10000	-9	16	1197	341	251	223	1105	329	246	218	1046	322	244	216
15000	-19	-2	1151	304	259	213	1069	293	254	208	1000	285	250	205
20000	-28	-19	1078	269	266	201	1013	261	261	198	966	254	259	196
23000	-34	-29	1107	260	276	199	991	245	267	193	923	236	263	190
25000	-38	-36	1095	250	280	196	1005	238	274	191	890	223	264	184
27000	-42	-43	1067	240	283	191	992	230	278	188	899	217	270	182
28000	-43	-46	1060	236	285	189	984	226	280	186	897	214	272	181
29000	-45	-49	1073	235	289	189	975	221	282	184	906	212	277	181
31000	-49	-56	1074	230	293	185	969	215	286	180	886	204	280	177
33000	-53	-63	1063	224	297	181	970	211	290	177	869	197	283	172
35000	-56	-70	1047	218	300	176	959	205	294	172	870	193	287	169
37000	-58	-73	1023	212	303	171	947	200	298	168	867	188	293	165
39000	-58	-72	1006	207	307	165	935	196	303	163	856	184	297	160
41000	-58	-72	-	-	-	-	911	190	306	157	842	179	302	155

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 9-123. MAXIMUM RANGE POWER - 2000 RPM - ISA -10°C (ref. Fig. 5-53)

MAXIMUM RANGE POWER
2000 RPM
ISA

PRESSURE ALTITUDE	IOAT		11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	20	68	1169	414	232	233	1104	405	229	230	1037	394	227	228
5000	10	51	1176	376	242	226	1112	367	239	224	1047	358	236	221
10000	1	34	1178	341	252	219	1110	332	250	217	1044	323	246	214
15000	-9	17	1139	305	261	210	1070	296	257	207	999	287	253	203
20000	-18	-1	1081	272	269	200	1016	264	265	196	948	255	260	193
23000	-24	-11	1112	264	279	198	998	249	271	191	907	237	264	186
25000	-28	-18	1101	254	284	194	1009	241	277	189	908	228	270	184
27000	-31	-24	1089	246	289	191	997	233	281	186	906	221	274	181
28000	-33	-28	1085	243	291	189	988	229	283	184	909	218	277	180
29000	-35	-31	1083	240	293	187	983	226	286	182	908	215	280	179
31000	-39	-38	1092	236	299	184	981	220	290	179	896	208	285	176
33000	-42	-44	1084	230	303	180	984	216	296	176	890	202	290	172
35000	-46	-51	1058	222	304	175	979	210	300	172	882	196	292	168
37000	-48	-54	1043	217	309	170	960	204	303	167	885	193	299	164
39000	-48	-54	1025	212	313	165	952	201	309	162	872	188	304	159
41000	-47	-53	-	-	-	-	-	-	-	-	861	185	309	155

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 9-124. MAXIMUM RANGE POWER - 2000 RPM - ISA (ref. Fig. 5-55)

MAXIMUM RANGE POWER
2000 RPM
ISA +10°C

			11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	30	86	1112	408	229	227	1045	397	227	224	957	383	222	220
5000	20	69	1116	370	239	220	1054	361	236	217	987	351	233	214
10000	11	51	1144	340	252	215	1054	327	247	210	966	315	241	206
15000	1	35	1141	309	264	208	1071	299	260	205	979	287	254	200
20000	-8	18	1084	276	272	198	1017	267	267	195	948	257	263	191
23000	-14	7	1117	268	283	196	1001	252	274	190	908	239	266	184
25000	-18	0	1128	261	290	194	1013	245	280	188	897	229	271	181
27000	-21	-6	1100	251	293	190	1024	240	288	186	923	226	279	181
28000	-23	-9	1093	247	295	188	1018	236	290	185	922	223	282	179
29000	-25	-12	1106	246	299	187	1006	232	292	183	919	220	285	178
31000	-28	-19	1114	242	305	184	1009	227	298	180	906	212	290	174
33000	-32	-26	1105	236	309	180	1003	221	302	175	903	207	295	171
35000	-36	-32	1086	230	312	175	1000	216	307	172	905	202	300	168
37000	-38	-36	1067	223	316	170	982	210	310	167	896	197	304	163
39000	-37	-35	-	-	-	-	977	207	317	163	895	194	311	160
41000	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6

Figure 9-125. MAXIMUM RANGE POWER - 2000 RPM - ISA +10°C (ref. Fig. 5-56)

MAXIMUM RANGE POWER
2000 RPM
ISA +20°C

PRESSURE ALTITUDE	IOAT		11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	40	103	1053	403	226	220	988	391	224	218	900	376	219	213
5000	30	86	1062	366	236	213	994	355	233	210	930	345	230	208
10000	21	69	1110	339	251	210	1014	325	245	205	925	311	239	200
15000	11	52	1124	311	264	205	1037	298	258	200	944	285	252	195
20000	2	36	1087	280	275	196	1005	268	268	192	934	259	264	188
23000	-4	25	1130	273	287	195	1003	256	277	188	908	242	269	183
25000	-7	19	1126	264	293	192	1025	250	285	187	905	233	275	180
27000	-11	12	1118	257	298	189	1031	245	292	185	924	230	282	179
28000	-13	9	1121	254	302	188	1023	240	294	183	932	227	286	178
29000	-14	6	1124	251	304	187	1022	237	297	182	926	223	289	177
31000	-18	-1	1128	247	310	183	1026	232	304	179	916	216	294	173
33000	-22	-7	1126	242	315	180	1022	226	308	175	916	211	300	171
35000	-25	-14	1106	235	318	175	1021	222	313	172	925	208	306	168
37000	-27	-17	1036	221	311	164	1006	216	317	167	920	203	311	164
39000	-27	-17	-	-	-	-	-	-	-	-	875	193	308	155
41000	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 9-126. MAXIMUM RANGE POWER - 2000 RPM - ISA +20°C (ref. Fig. 5-57)

MAXIMUM RANGE POWER
2000 RPM
ISA +30°C

			11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	50	121	1037	405	227	217	948	389	222	212	863	374	218	208
5000	40	104	1047	369	237	210	959	354	232	206	871	339	226	201
10000	31	87	1091	342	251	207	979	324	244	201	890	310	238	196
15000	21	71	1111	314	265	202	1019	300	259	197	928	287	253	192
20000	12	54	1087	285	277	194	1011	274	272	190	929	262	265	186
23000	6	44	1159	282	294	196	1014	262	281	187	905	246	271	181
25000	3	37	1167	275	301	194	1039	257	289	186	902	237	277	178
27000	-1	31	1164	267	308	192	1053	252	298	185	933	235	286	178
28000	-2	28	1160	263	311	190	1059	249	302	185	948	234	292	178
29000	-4	25	1165	261	313	188	1046	244	304	182	954	231	296	178
31000	-8	18	1176	256	320	186	1050	239	310	180	942	223	301	174
33000	-11	12	1073	236	307	171	1060	234	317	177	945	218	308	172
35000	-15	5	-	-	-	-	974	217	305	164	955	214	315	169
37000	-18	-1	-	-	-	-	-	-	-	-	847	194	294	151
39000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41000	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 9-127. MAXIMUM RANGE POWER - 2000 RPM - ISA +30°C (ref. Fig. 5-58)

MAXIMUM RANGE POWER
1800 RPM
ISA -30°C

PRESSURE ALTITUDE	IOAT		11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	-10	15	1548	435	239	254	1475	427	237	252	1400	419	235	250
5000	-19	-3	1489	386	244	242	1416	378	242	240	1342	370	240	238
10000	-29	-20	1388	338	248	229	1319	331	246	227	1252	323	243	224
15000	-39	-38	1282	295	252	216	1236	290	251	215	1167	283	248	212
20000	-49	-55	1187	260	258	204	1125	253	255	202	1059	245	251	198
23000	-54	-66	1183	247	264	200	1077	235	258	194	1007	227	254	191
25000	-58	-73	1169	237	268	196	1073	226	262	191	968	214	255	186
27000	-62	-80	1137	226	270	191	1070	219	267	189	976	208	260	184
28000	-64	-83	1122	222	270	188	1052	213	267	186	971	204	262	182
29000	-66	-87	1120	219	271	186	1033	208	268	183	954	199	263	180
31000	-70	-93	1093	210	270	178	1021	201	270	179	935	191	266	176
33000	-74	-100	1083	205	271	173	991	193	268	171	914	183	267	170
35000	-78	-108	1063	199	270	167	972	187	267	165	894	176	266	164
37000	-80	-111	1071	197	276	163	971	183	270	160	881	171	267	158
39000	-80	-111	1081	197	282	160	976	182	276	156	877	168	270	152
41000	-79	-110	1127	203	298	161	992	183	284	153	889	168	277	149

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 9-128. MAXIMUM RANGE POWER - 1800 RPM - ISA -30°C (ref. Fig. 5-58)

MAXIMUM RANGE POWER
1800 RPM
ISA -20°C

PRESSURE ALTITUDE	IOAT		11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	0	32	1497	431	239	249	1421	422	237	247	1344	413	235	245
5000	-9	15	1443	383	244	237	1348	372	240	234	1271	363	238	231
10000	-19	-2	1375	339	250	226	1304	331	247	223	1229	323	244	221
15000	-29	-20	1288	298	256	214	1240	293	254	213	1169	285	251	210
20000	-38	-37	1178	261	260	201	1130	256	258	200	1061	248	254	197
23000	-44	-48	1209	252	270	199	1082	238	261	193	1010	229	257	190
25000	-48	-55	1184	241	273	195	1097	231	268	191	972	217	258	184
27000	-52	-61	1168	233	277	191	1083	223	271	188	976	210	263	182
28000	-54	-65	1152	228	278	189	1065	218	272	185	983	208	267	181
29000	-56	-68	1135	224	276	185	1063	215	275	184	966	203	267	178
31000	-59	-75	1123	217	277	179	1035	206	275	177	948	195	271	175
33000	-63	-82	1106	211	277	173	1016	199	274	171	922	187	271	169
35000	-67	-89	1088	205	277	166	997	193	274	164	917	182	273	164
37000	-69	-93	1097	204	282	163	990	189	276	159	907	178	274	158
39000	-69	-92	1119	205	292	161	1003	189	283	156	905	175	278	153
41000	-69	-92	1155	210	306	161	1024	190	293	154	907	173	283	148

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 9-129. MAXIMUM RANGE POWER - 1800 RPM - ISA -20°C (ref. Fig. 5-59)

MAXIMUM RANGE POWER
1800 RPM
ISA -10°C

PRESSURE ALTITUDE	IOAT		11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	10	50	1379	416	234	239	1299	406	231	237	1200	393	228	233
5000	1	33	1402	380	244	233	1324	371	241	230	1244	361	239	228
10000	-9	16	1356	340	251	223	1282	331	248	220	1187	320	244	216
15000	-19	-2	1271	299	257	211	1205	291	254	208	1132	283	250	205
20000	-28	-19	1183	264	263	200	1133	258	261	198	1063	250	257	195
23000	-34	-29	1211	255	273	197	1092	241	265	191	1012	232	260	188
25000	-38	-36	1197	245	277	194	1110	235	272	190	993	221	264	184
27000	-42	-43	1178	237	281	190	1096	227	276	186	987	214	268	181
28000	-43	-46	1167	233	282	187	1095	224	279	185	990	211	271	180
29000	-45	-49	1165	230	283	185	1076	219	280	183	995	209	275	179
31000	-49	-56	1138	222	282	178	1053	211	281	177	972	201	278	175
33000	-53	-63	1125	216	283	172	1042	205	281	171	944	192	278	169
35000	-57	-71	1119	212	285	167	1029	200	282	165	926	186	277	162
37000	-59	-74	1119	209	289	162	1013	194	283	159	926	182	280	158
39000	-59	-74	1141	211	298	160	1023	194	289	155	922	179	284	152
41000	-59	-73	-	-	-	-	1039	195	298	153	924	178	289	148

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 9-130. MAXIMUM RANGE POWER - 1800 RPM - ISA -10°C (ref. Fig. 5-60)

MAXIMUM RANGE POWER
1800 RPM
ISA

PRESSURE ALTITUDE	IOAT		11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
	20	68	1268	403	228	230	1185	391	226	227	1108	381	224	225
5000	10	51	1315	371	240	225	1234	361	237	222	1151	350	234	219
10000	1	34	1319	338	251	218	1243	328	248	215	1163	319	244	212
15000	-9	17	1279	303	261	210	1206	295	257	207	1132	286	253	203
20000	-18	-1	1187	267	267	198	1116	259	262	195	1064	253	260	193
23000	-24	-11	1223	260	277	196	1090	244	268	189	995	232	261	184
25000	-28	-18	1210	250	281	192	1103	237	274	187	990	223	266	182
27000	-31	-25	1191	242	285	189	1108	231	280	185	998	218	272	180
28000	-33	-28	1188	239	288	187	1101	228	283	184	997	215	275	178
29000	-35	-31	1178	235	288	184	1093	224	285	182	994	211	277	177
31000	-39	-38	1153	227	287	177	1064	215	285	175	982	204	282	174
33000	-43	-45	1140	221	287	171	1056	210	286	170	965	198	284	169
35000	-47	-52	1137	217	290	166	1039	203	286	164	946	191	283	162
37000	-49	-56	1128	213	292	161	1030	199	288	158	932	185	284	156
39000	-49	-55	1152	215	302	158	1039	199	294	154	933	183	288	151
41000	-48	-55	-	-	-	-	-	-	-	-	940	183	294	147

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 9-131. MAXIMUM RANGE POWER - 1800 RPM - ISA (ref. Fig. 5-61)

MAXIMUM RANGE POWER
1800 RPM
ISA +10°C

PRESSURE ALTITUDE	IOAT		11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	30	85	1206	396	226	223	1122	384	223	221	1021	369	219	217
5000	20	68	1233	364	236	217	1149	352	233	214	1064	340	230	211
10000	11	51	1277	336	250	213	1182	324	245	209	1078	310	239	204
15000	1	34	1261	304	261	206	1186	295	258	203	1094	284	252	199
20000	-8	17	1188	271	269	196	1118	262	265	193	1049	254	261	190
23000	-14	7	1234	264	281	195	1100	248	272	188	1006	236	265	184
25000	-18	0	1240	257	288	193	1115	241	278	186	981	225	268	179
27000	-21	-6	1218	248	292	189	1118	236	285	184	1016	223	277	179
28000	-23	-9	1209	245	293	187	1110	232	287	182	1014	220	280	178
29000	-25	-13	1194	240	293	183	1100	228	289	180	1009	216	282	176
31000	-28	-19	1182	234	293	177	1090	221	292	176	1001	210	288	173
33000	-32	-26	1160	227	293	170	1065	214	290	169	975	202	288	167
35000	-36	-33	1151	222	294	165	1061	209	292	164	964	196	289	162
37000	-38	-37	1157	220	300	161	1055	205	295	158	953	191	290	156
39000	-38	-37	-	-	-	-	1037	201	296	151	958	189	296	151
41000	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 9-132. MAXIMUM RANGE POWER - 1800 RPM - ISA +10°C (ref. Fig. 5-62)

PIAGGIO AERO

MAXIMUM RANGE POWER
1800 RPM
ISA +20°C

			11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
PRESSURE ALTITUDE	IOAT		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	39	103	1127	388	222	215	1041	375	219	213	960	361	216	210
5000	30	86	1175	359	233	210	1089	347	230	207	1002	334	226	204
10000	21	69	1220	333	247	207	1118	319	241	202	1018	305	236	197
15000	11	52	1227	304	260	202	1150	294	256	198	1071	284	252	195
20000	2	35	1164	272	269	192	1097	263	265	189	1028	254	261	186
23000	-4	25	1242	269	285	193	1091	250	273	185	1001	239	267	181
25000	-7	19	1251	262	292	192	1128	247	283	185	983	228	271	177
27000	-11	12	1236	254	297	188	1131	241	289	183	1017	226	280	177
28000	-13	9	1222	250	298	186	1130	238	292	182	1024	224	284	177
29000	-14	6	1211	246	297	182	1117	233	294	180	1030	222	288	176
31000	-18	-1	1206	240	299	177	1103	226	296	175	1014	214	292	173
33000	-22	-8	1186	233	299	170	1092	220	297	169	997	207	295	168
35000	-26	-15	1181	229	302	165	1075	214	297	163	982	201	295	161
37000	-28	-19	1077	211	285	149	1081	211	302	159	974	196	297	156
39000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41000	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 9-133. MAXIMUM RANGE POWER - 1800 RPM - ISA +20°C (ref. Fig. 5-63)

MAXIMUM RANGE POWER
1800 RPM
ISA +30°C

PRESSURE ALTITUDE	IOAT		11500 LBS (5216 KG)				10500 LBS (4763 KG)				9500 LBS (4309 KG)			
			ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED		ENGINE TORQUE	FUEL FLOW PER ENGINE	AIRSPEED	
					TAS	IAS			TAS	IAS			TAS	IAS
FEET	°C	°F	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS	LB • FT	LBS/HR	KTS	KTS
0	49	121	1110	391	222	212	1004	374	217	208	917	358	214	205
5000	40	104	1134	358	231	205	1032	342	226	201	944	328	223	198
10000	30	87	1200	335	247	203	1081	318	240	197	975	303	234	192
15000	21	70	1228	310	263	200	1130	296	256	195	1014	281	248	189
20000	12	54	1180	279	273	192	1103	269	268	188	1019	258	262	184
23000	6	43	1270	278	291	194	1101	256	277	184	986	241	268	178
25000	3	37	1274	270	297	191	1140	253	287	185	979	232	273	175
27000	-1	31	1277	264	305	190	1163	249	296	184	1024	231	284	176
28000	-3	27	1256	258	305	187	1163	246	299	183	1034	230	288	176
29000	-4	24	1254	255	306	184	1148	241	301	181	1041	228	292	175
31000	-8	18	1242	248	307	178	1133	234	303	175	1035	221	298	173
33000	-12	11	1131	229	291	162	1126	227	305	170	1024	214	302	168
35000	-16	4	-	-	-	-	1026	210	289	155	1015	208	303	163
37000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
39000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41000	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTE 1:

Natural Laminar Flow Degradation effect is a speed reduction of 5%, maintaining torque as indicated in the Table.

NOTE 2:

During operation with Anti Icing systems on torque will decrease.
In order to maintain aximum range configuration do not reset power to original setting.
Fuel flow will remain about the same, but true airspeed may decrease approximately 6 knots.

Figure 9-134. MAXIMUM RANGE POWER - 1800 RPM - ISA +30°C (ref. Fig. 5-64)

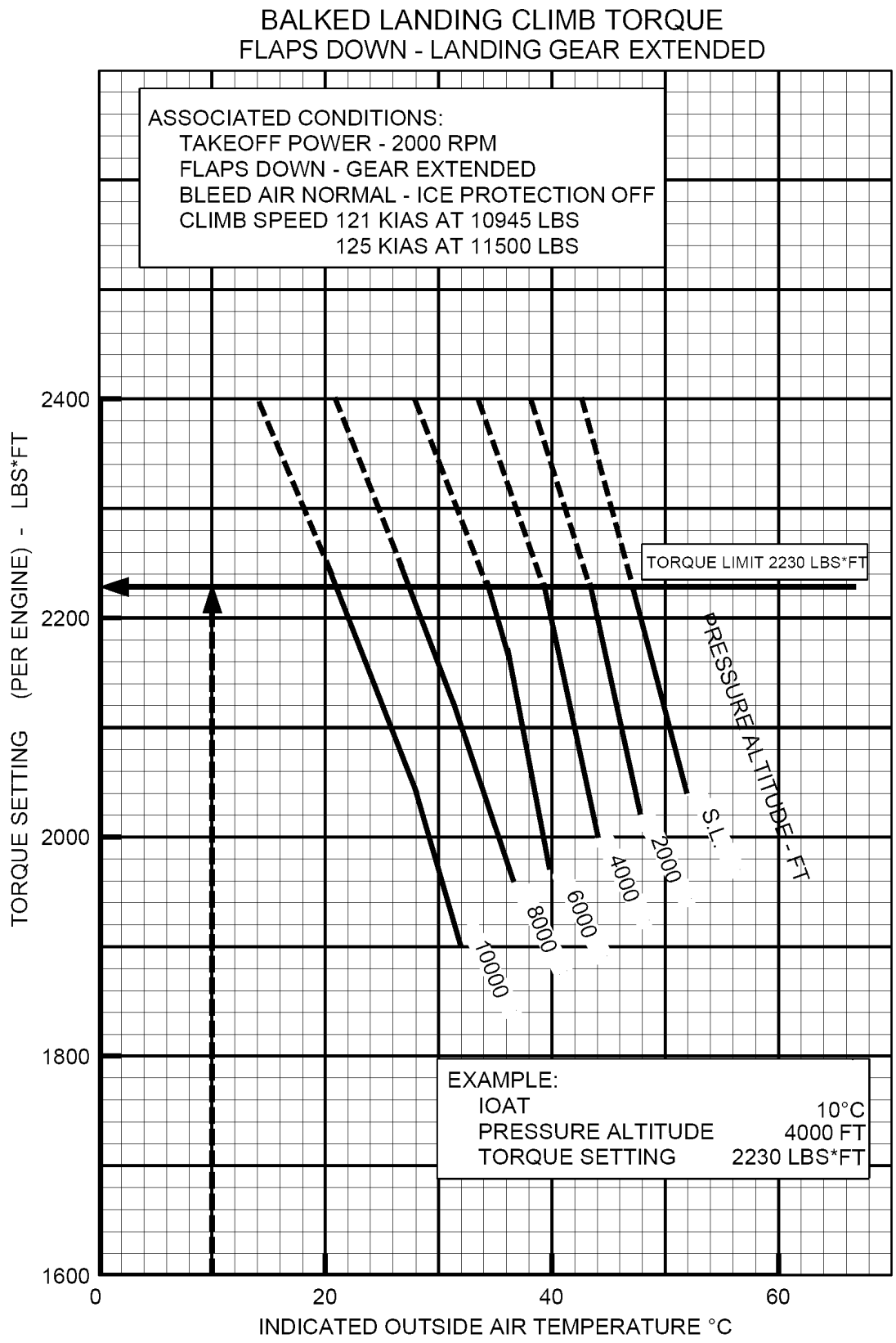


Figure 9-135. BALKED LANDING CLIMB TORQUE - FLAPS DOWN, LANDING GEAR EXTENDED (Equivalent to Fig. 5-70 of the basic AFM/POH)

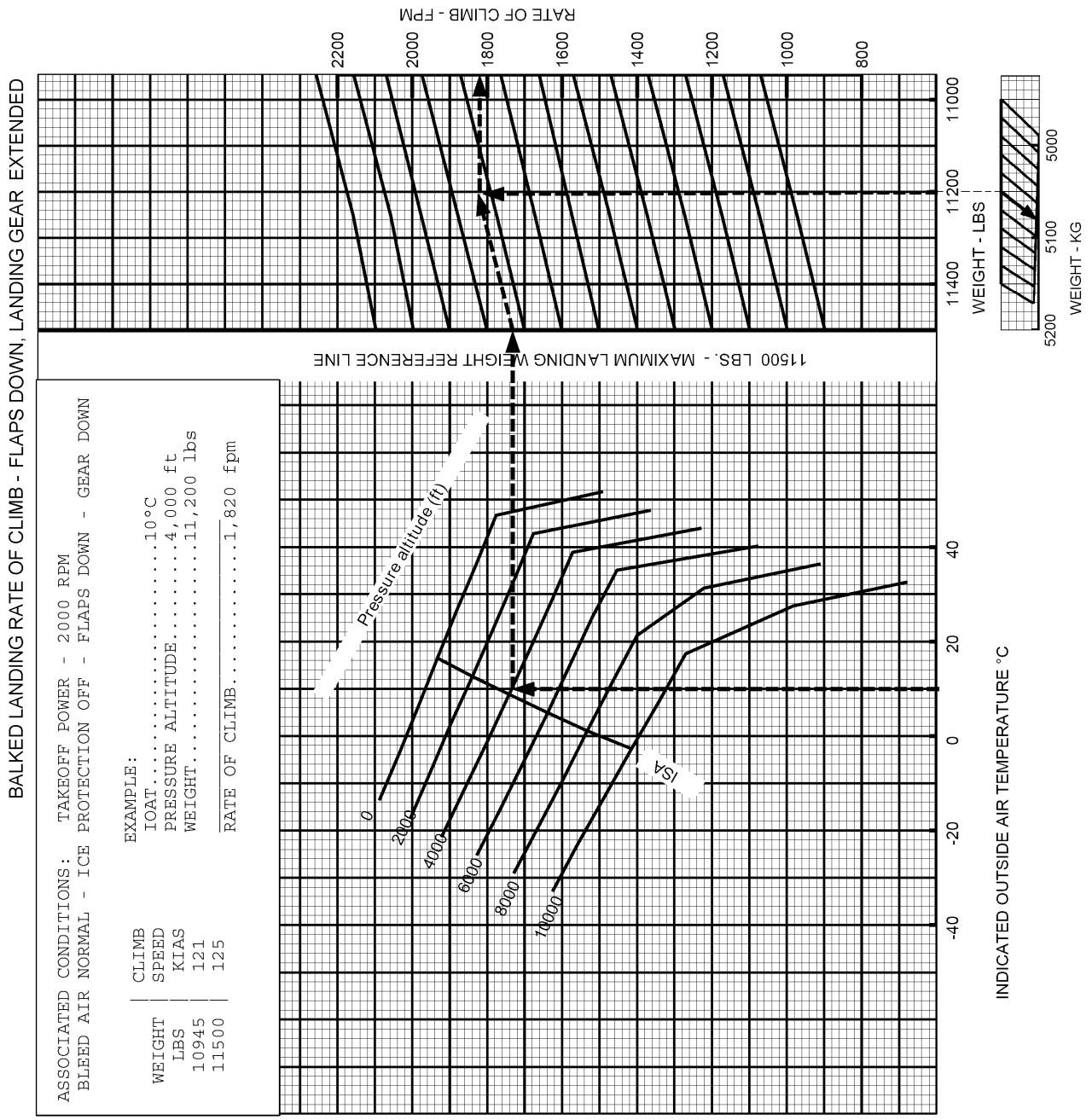


Figure 9-136. BALKED LANDING RATE OF CLIMB - FLAPS DOWN, LANDING GEAR EXTENDED (For lower weights refer to Fig. 5-71 of the basic AFM/POH)

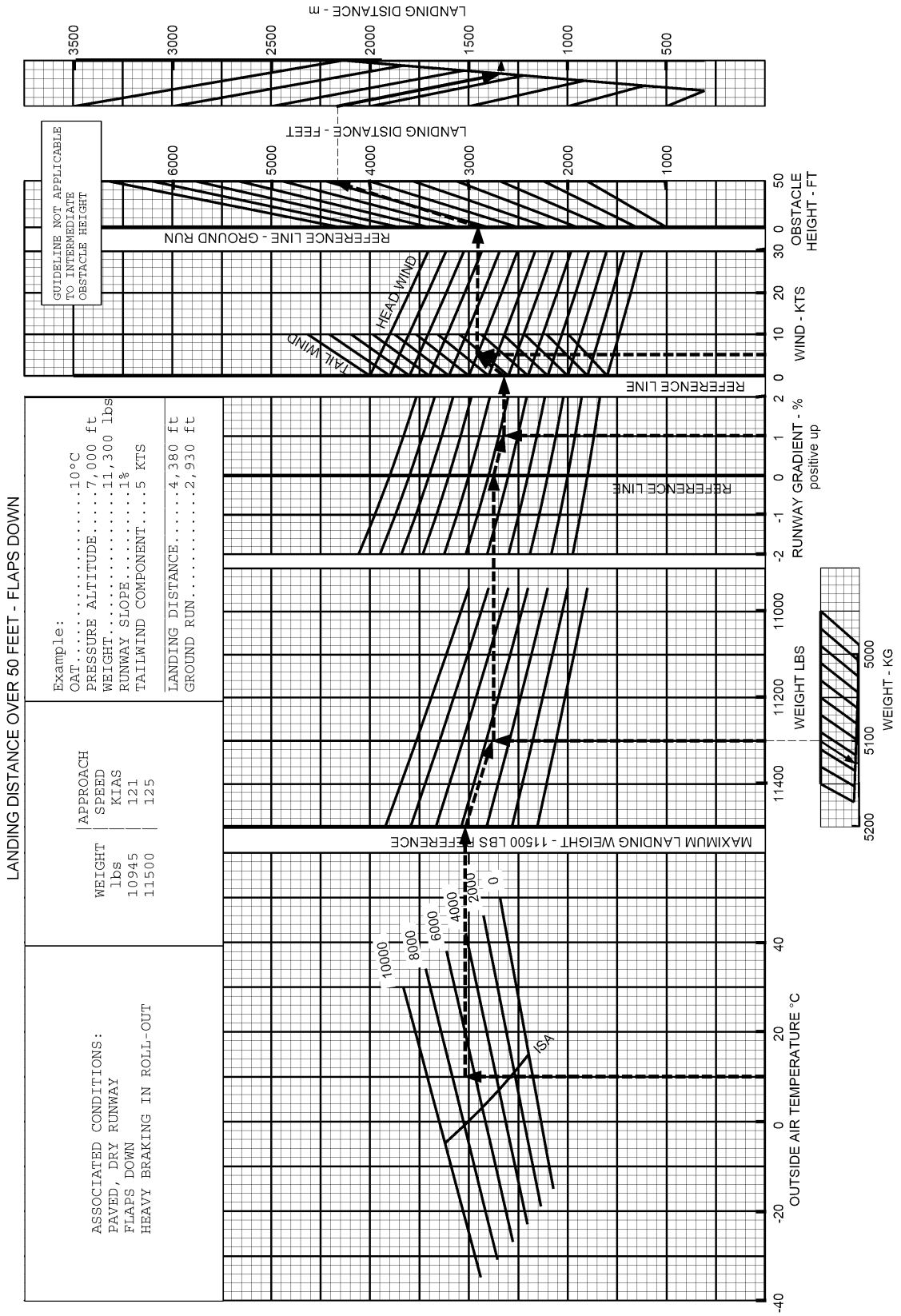


Figure 9-137. LANDING DISTANCE OVER 50 FEET WITHOUT PROPELLER REVERSING - FLAPS DOWN (For lower weights refer to Fig. 5-72 of the basic AFM/POH)

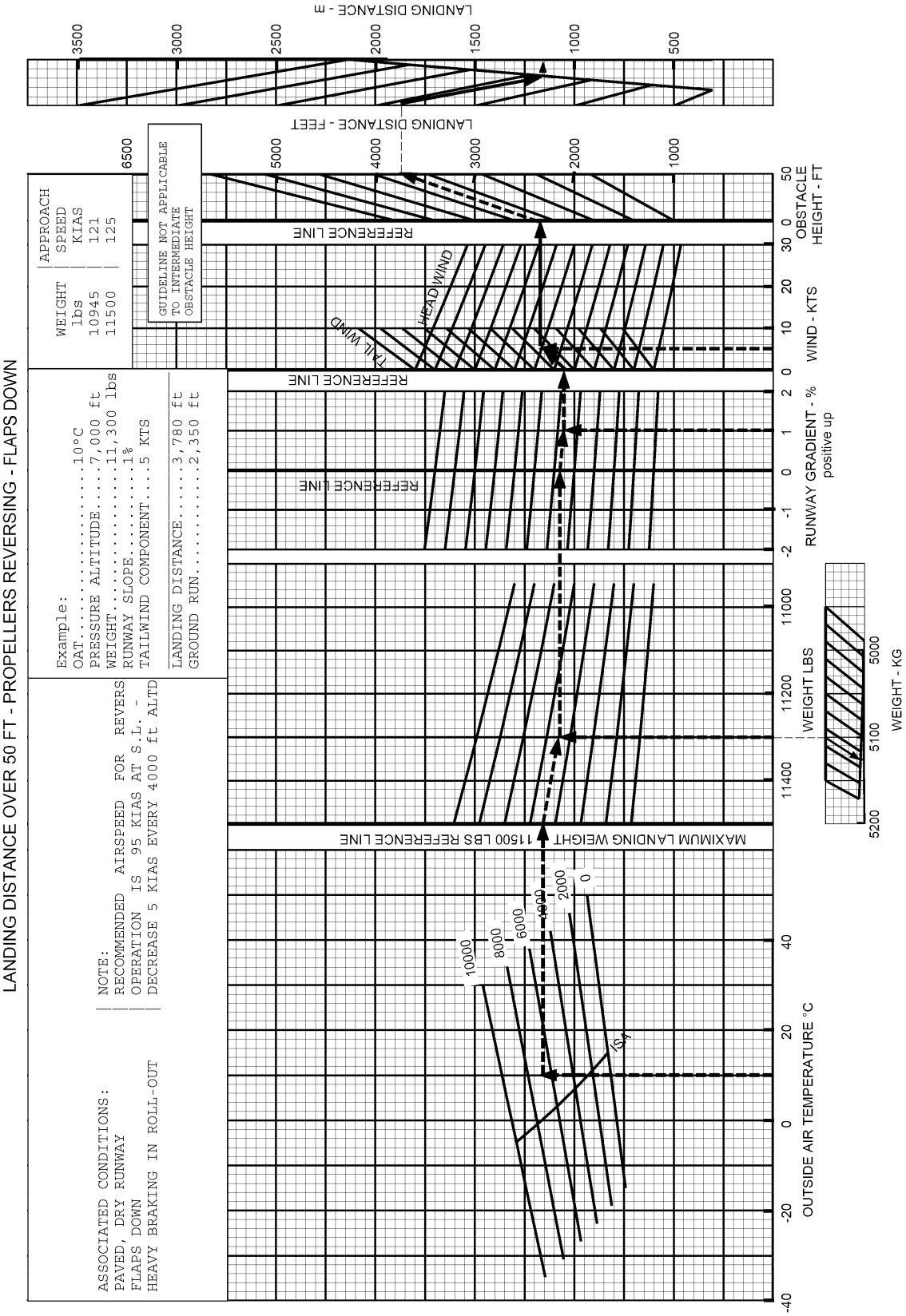


Figure 9-138. LANDING DISTANCE OVER 50 FEET WITH PROPELLER REVERSING - FLAPS DOWN (For lower weights refer to Fig. 5-73 of the basic AFM/POH)

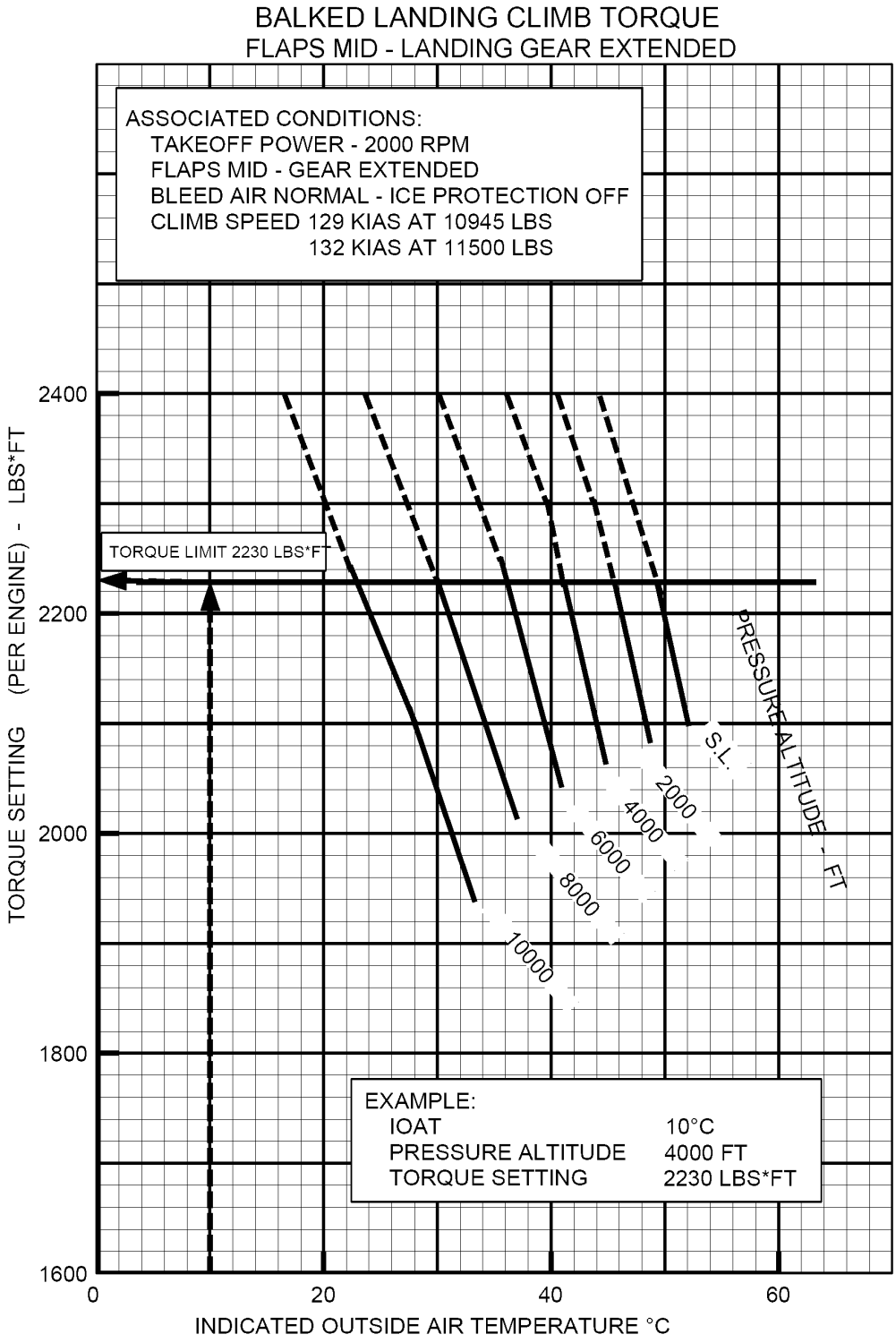


Figure 9-139. BALKED LANDING CLIMB TORQUE - FLAPS MID, LANDING GEAR EXTENDED (Equivalent to Fig. 5-74 of the basic AFM/POH)

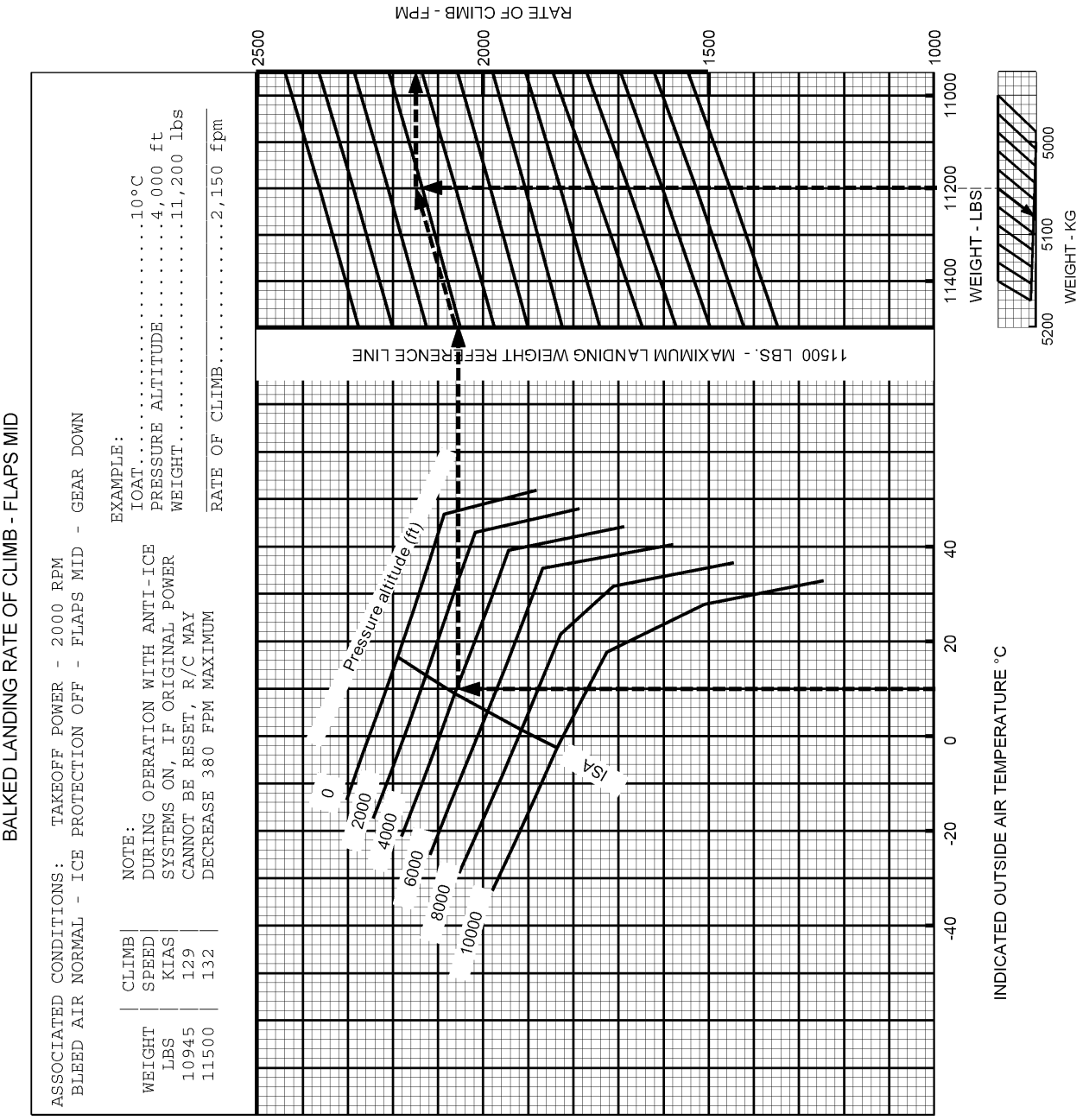


Figure 9-140. BALKED LANDING RATE OF CLIMB - FLAPS MID
(For lower weights refer to Fig. 5-75 of the basic AFM/POH)

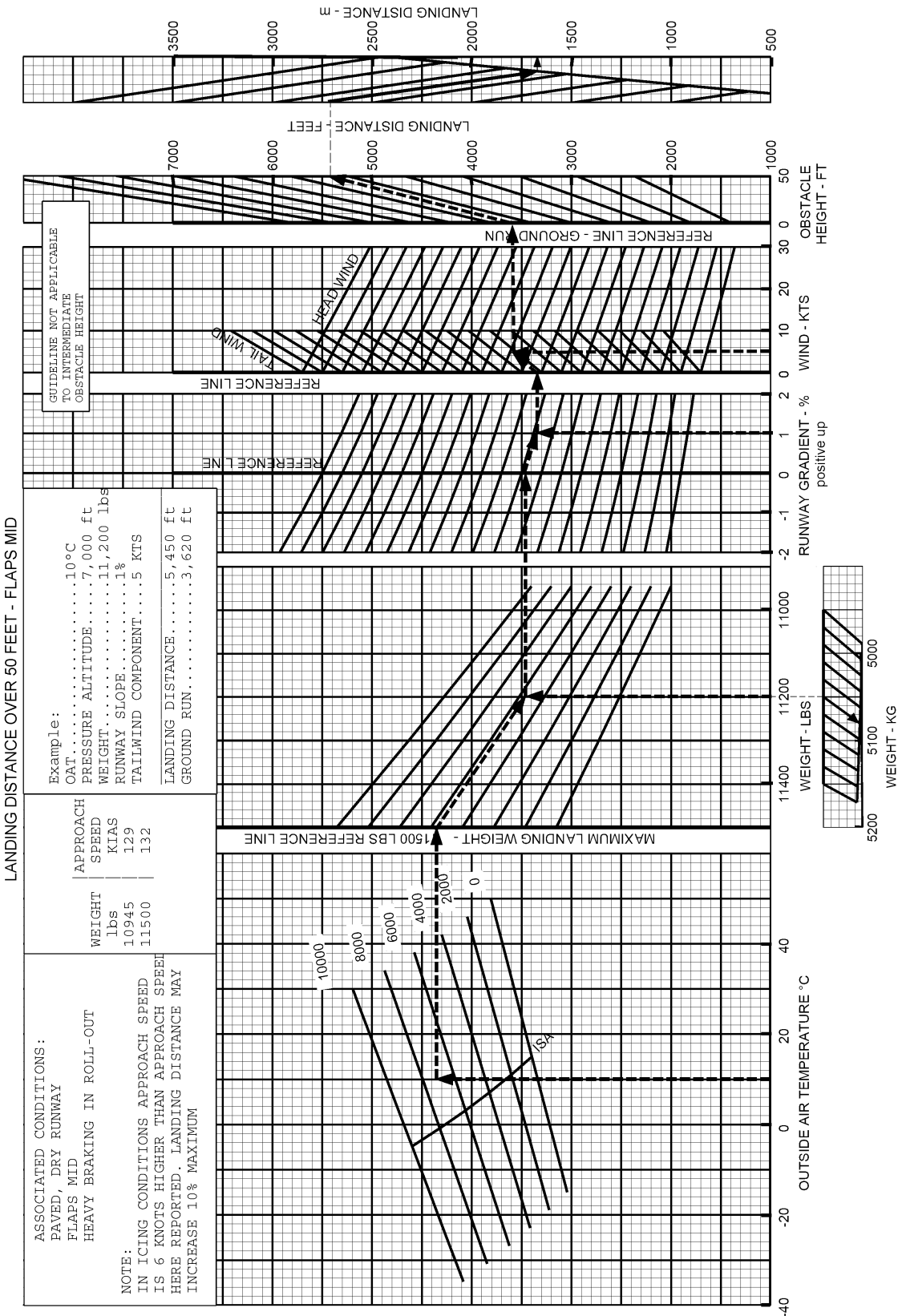


Figure 9-141. LANDING DISTANCE OVER 50 FEET WITHOUT PROPELLER REVERSING - FLAPS MID (For lower weights refer to Fig. 5-76 of the basic AFM/POH)

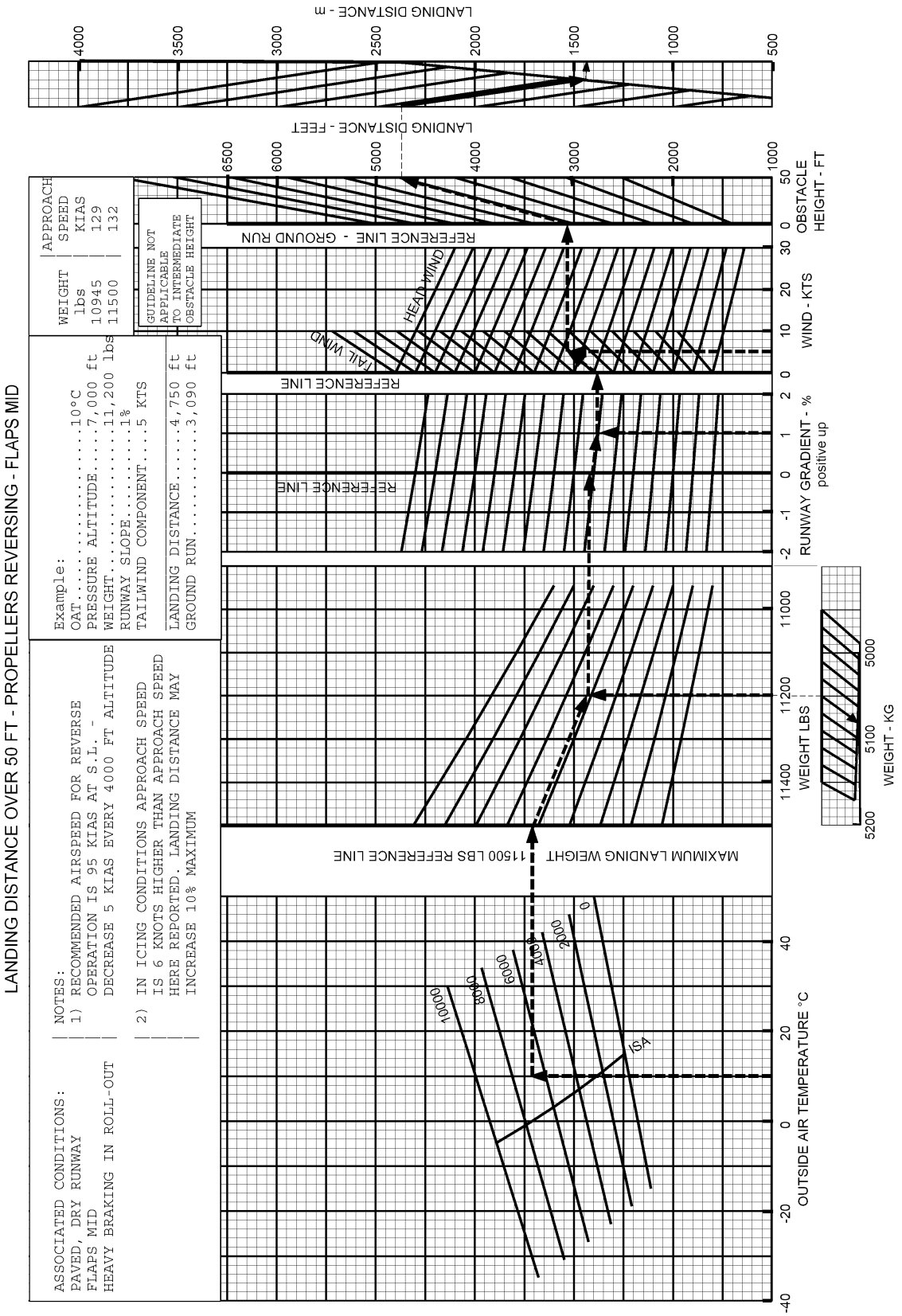

LANDING DISTANCE OVER 50 FT - PROPELLERS REVERSING - FLAPS MID
LANDING DISTANCE - m
LANDING DISTANCE - FEET
APPROACH SPEED KIAS
WEIGHT lbs
10945 129
11500 132
GUIDELINE NOT APPLICABLE TO INTERMEDIATE OBSTACLE HEIGHT
Example:
OAT.....10°C
PRESSURE ALTITUDE.....7,000 ft
WEIGHT.....11,200 lbs
RUNWAY SLOPE.....1%
TAILWIND COMPONENT...5 KTS
LANDING DISTANCE.....4,750 ft
GROUND RUN.....3,090 ft
ASSOCIATED CONDITIONS:
PAVED, DRY RUNWAY
FLAPS MID
HEAVY BRAKING IN ROLL-OUT
NOTES:
1) RECOMMENDED AIRSPEED FOR REVERSE OPERATION IS 95 KIAS AT S.L. - DECREASE 5 KIAS EVERY 4000 FT ALTITUDE
2) IN ICING CONDITIONS APPROACH SPEED IS 6 KNOTS HIGHER THAN APPROACH SPEED HERE REPORTED. LANDING DISTANCE MAY INCREASE 10% MAXIMUM
REFERENCE LINE - GROUND RUN
HEAD WIND
TAIL WIND
REFERENCE LINE
REFERENCE LINE
MAXIMUM LANDING WEIGHT 11500 LBS REFERENCE LINE
OBSTACLE HEIGHT - FT
WIND - KTS
RUNWAY GRADIENT - % positive up
WEIGHT LBS
WEIGHT - KG
OUTSIDE AIR TEMPERATURE °C
ISA

Figure 9-142. LANDING DISTANCE OVER 50 FEET WITH PROPELLER REVERSING - FLAPS MID (For lower weights refer to Fig. 5-77 of the basic AFM/POH)

PIAGGIO AERO

CAT II OPERATIONS

APPLICABLE TO SUPPLEMENT N. 26 "CATEGORY II OPERATIONS"

SECTION 5 - PERFORMANCE

Performance data provided by Section 5 of Supplement No. 26 are integrated, for Maximum Landing Weight higher than 10945 lbs (4965 kg), by the following additional information that have to be considered when CAT II approaches are conducted:

a. "Landing Weight in Single Engine Go Around" data, as per Figure 9-45 of Supplement No. 26, are integrated by Figure 9-143;

b. "Landing Distance over 50 feet without Propeller Reversing (Flaps Down)" data, as per Figure 9-137 of this Supplement, must be increased by approximately 8%;

c. Landing Distance in icing conditions, with Flap MID and without Propeller Reversing, as per Figure 9-141 of this Supplement must be increased approximately 10%.

NOTE

The EASA not approved Figure 9-138 of this Supplement provides the "Landing Distance over 50 feet with Propeller Reversing (Flaps Down)" which has to be increased by approximately 9%.

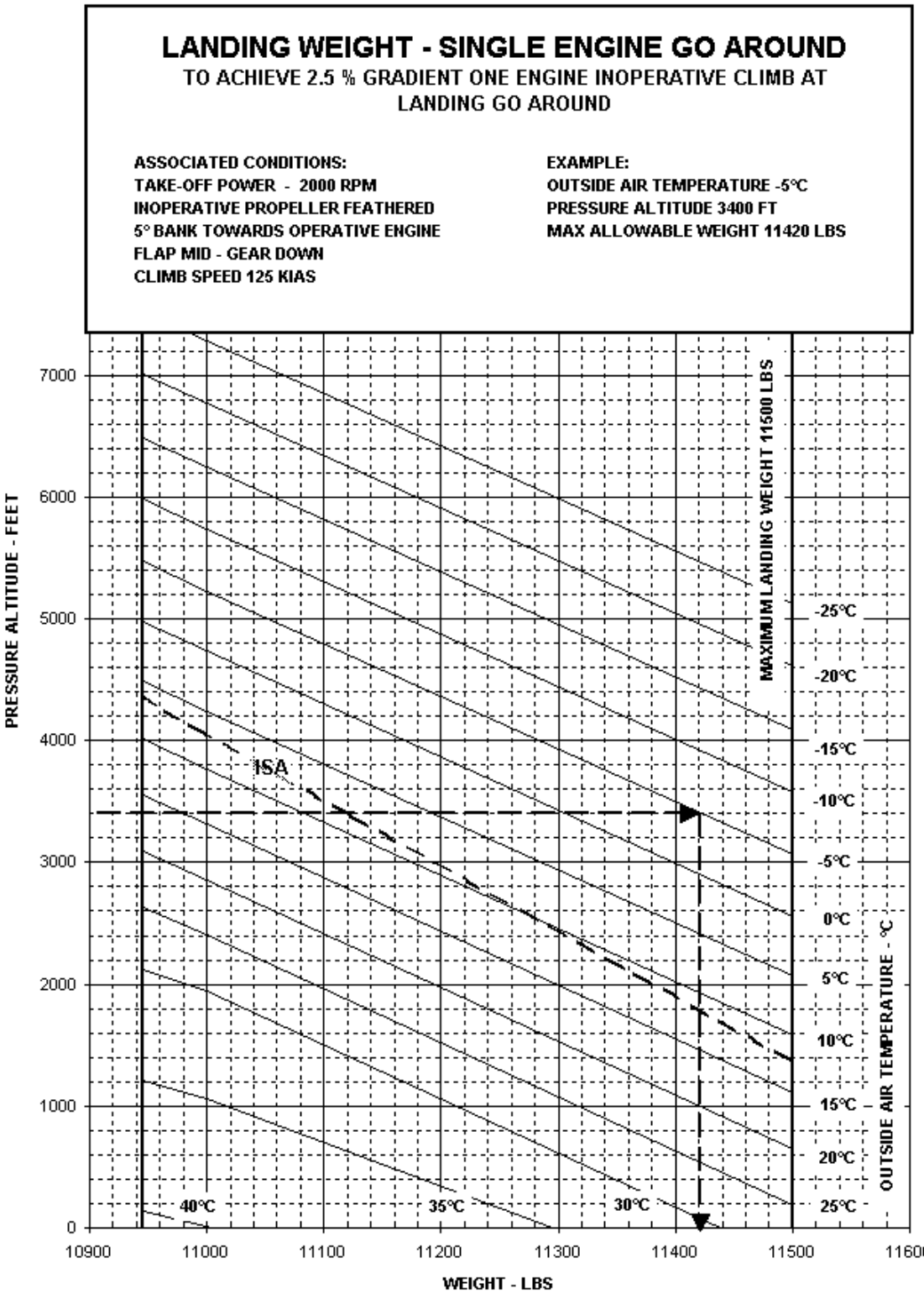


Figure 9-143. LANDING WEIGHT - SINGLE ENGINE GO AROUND
(For lower weights refer to Fig. 9-45 of Supplement No. 26)

SECTION 6 – WEIGHT AND BALANCE

LOADING INSTRUCTIONS

The applicable minimum and maximum approved moments are shown in the following "Weight, Moment and Center of Gravity Limits" graph.

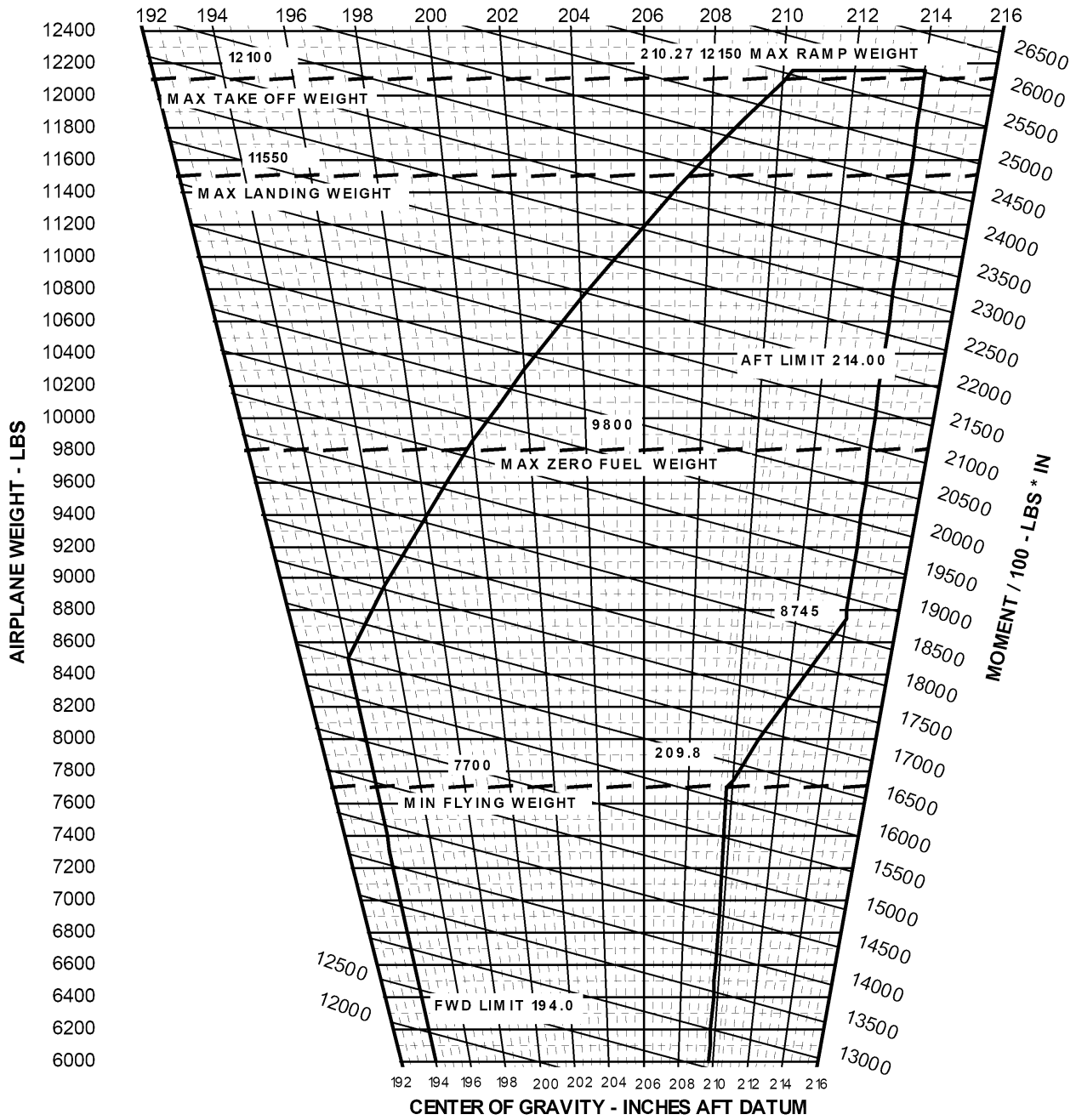


Figure 9-144. WEIGHT, MOMENT AND CENTER OF GRAVITY LIMITS GRAPH

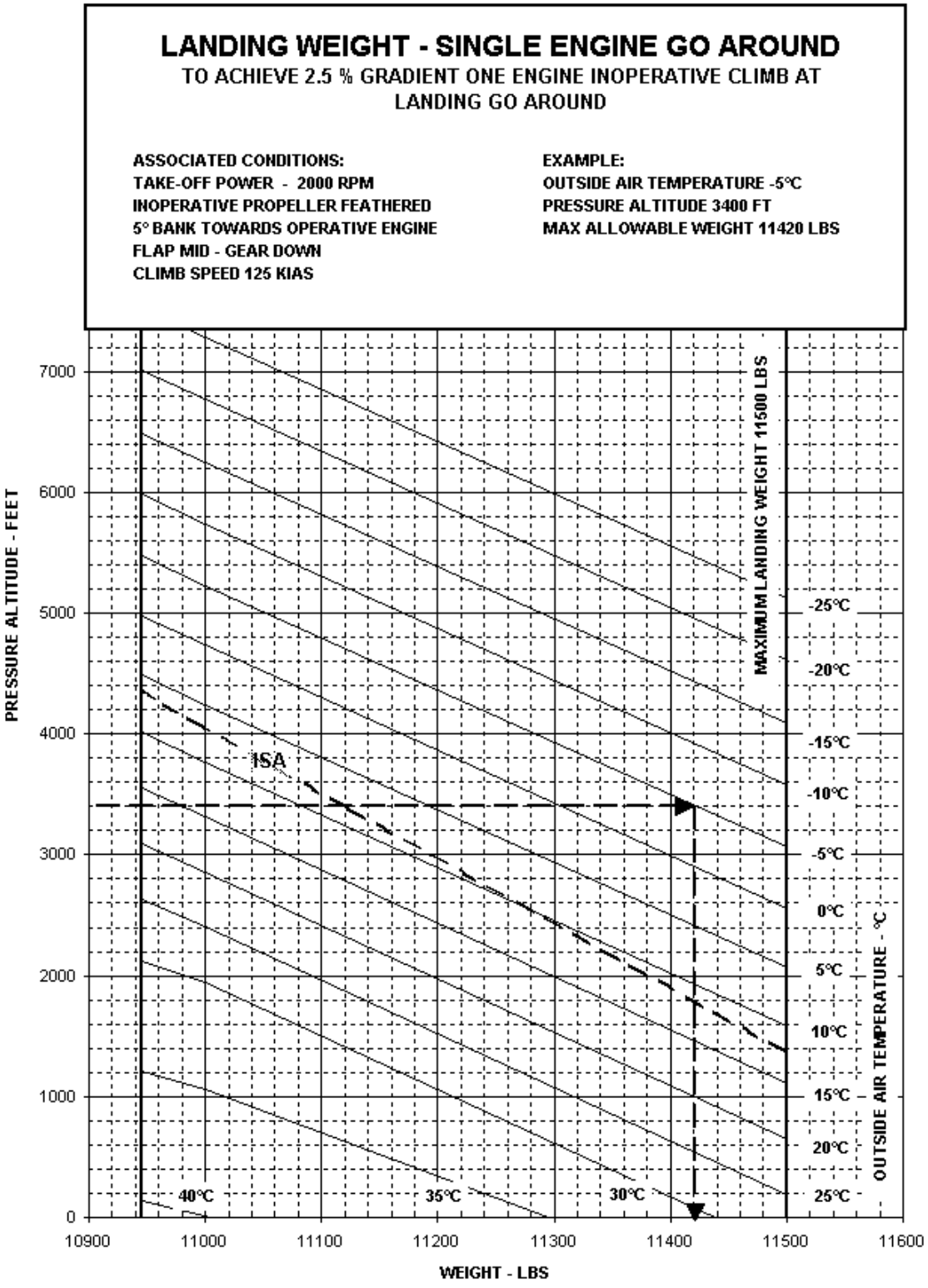


Figure 9-143. LANDING WEIGHT - SINGLE ENGINE GO AROUND
(For lower weights refer to Fig. 9-45 of Supplement No. 26)

PIAGGIO AERO

SECTION 6 – WEIGHT AND BALANCE

LOADING INSTRUCTIONS

The applicable minimum and maximum approved moments are shown in the following "Weight, Moment and Center of Gravity Limits" graph.

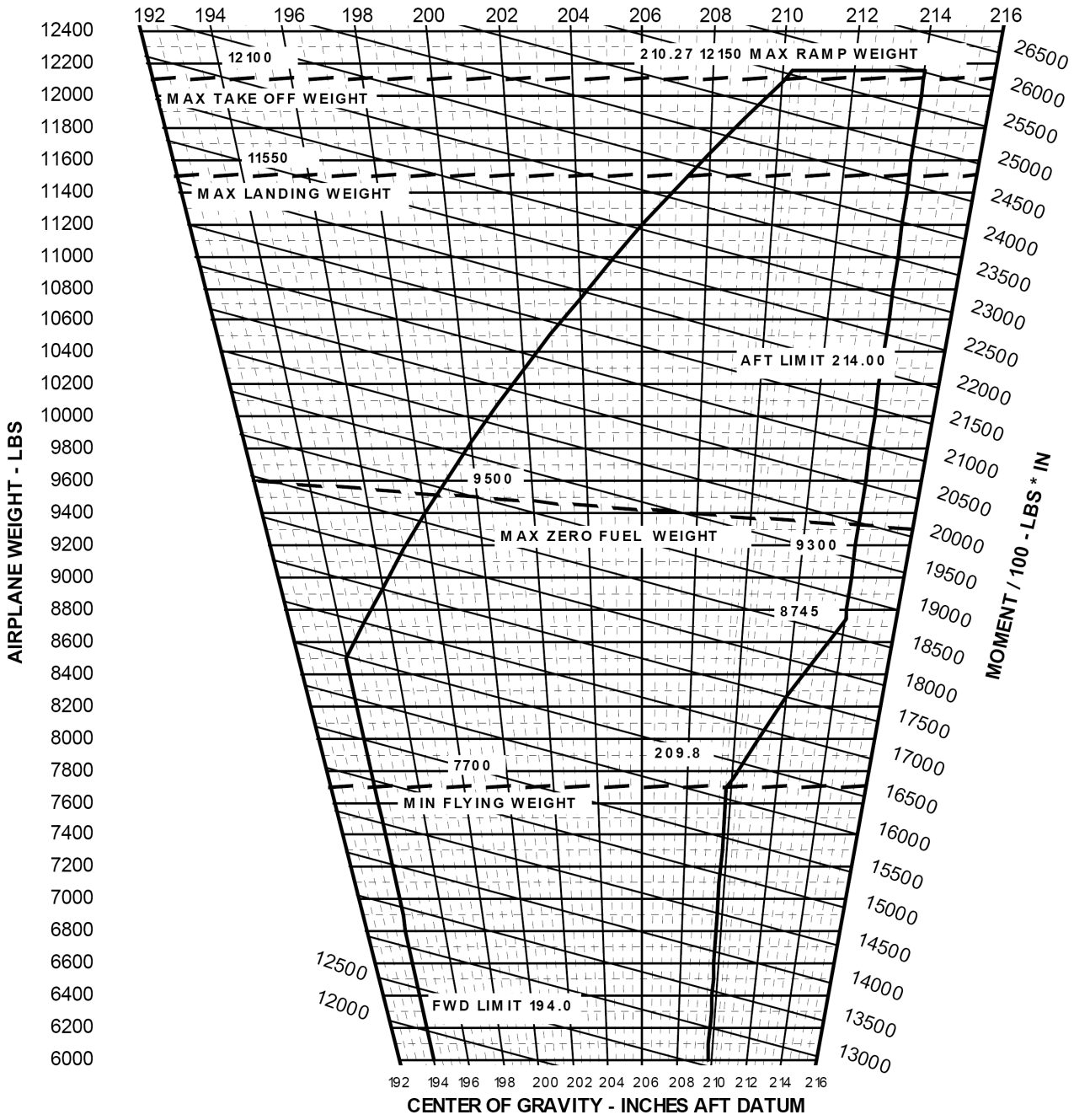


Figure 9-144 bis. WEIGHT, MOMENT AND CENTER OF GRAVITY LIMITS GRAPH

EQUIPMENT LIST

Weight and Balance data included in Section 6 of the basic Pilot's Operating Handbook and Approved Airplane Flight Manual must be completed with the following data when the airplane is modified as per Service Bulletin 80-0215 (Mod. N. 80-0642).

ATA No.	ITEM DESCRIPTION AND PART NUMBER	WEIGHT LBS	ARM IN	MOMENT LBS • IN/100	Q.TY	MARK IF INSTL.
32	**LANDING GEAR**					
32-10	MAIN LANDING GEAR					
	- Main Gear Unit, LH Dowty Rotol Ltd. 201416005	68.00	250.00	170.00	1	
	and					
	- Main Gear Unit, RH Dowty Rotol Ltd. 201416006	68.00	250.00	170.00	1	
	that inlude:					
	- MLG Shock Absorber Dowty Rotol Ltd. 201417003 (1)				2	
	(1) Replaces the basic MLG Shock Absorber P/N 201417002.					

SECTION 7 – DESCRIPTION AND OPERATION

No changes to the basic Description and Operation provided by Section 7 of the Pilot's Operating Handbook are necessary for this Supplement.

SECTION 8 – AIRPLANE HANDLING, SERVICE AND MAINTENANCE

The basic POH Ground Servicing informations for Main Landing Gear and Tires are modified as follows:

a. the MLG shock absorbers nitrogen pressure must be 1075 ± 20 psig;

b. the main wheels tires inflation pressure must be 118 ± 2 psig.